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ABSTRACT

Papers from the 1990 CAUSE conference on information technology in higher education are presented. They are organized according to the conference's eight concurrent tracks in the general areas of policy and planning, management, organization, and support services, as well as in the specialized areas of communications, hardware/software strategies, and applications. The 47 papers include the keynote address, "Challenges and Opportunities" by Robert C. Heterick, Jr., which summarized changes in campus environments over the past two decades and suggests ways in which higher education will have to meet new demands with limited resources, and the luncheon address "Competing with Computing" by James C. Wetherbe which emphasized that effectiveness, rather than efficiency, should be the focus of information systems. Also provided are summaries of the Current Issues, Round Table, and Ask the Experts sessions and Constituent Group meetings. Several black and white photographs illustrate the document. (GLR)

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Challenges and Opportunities of Information Technology in the 90s

Proceedings of the 1990 CAUSE National Conference

November 27 - 30, 1990
Fontainebleau Hilton Resort and Spa
Miami Beach, Florida

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CAUSE 90

MIAMI BEACH

NOVEMBER 27-30, 1990

Challenges and Opportunities of Information Technology in the 90s

Proceedings of the 1990 CAUSE National Conference

November 27 – 30, 1990
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Miami Beach, Florida

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Cassette tapes of general sessions, "Ask the Experts" sessions, and professional track presentations are available from Recorded Resources Corporation, P.O. Box 647, Millersville, MD 21108; phone 301/621-7120.

Individual papers in this publication are available to CAUSE members at the cost of reproduction from the CAUSE Exchange Library.

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CAUSE, the Professional Association for the Management of Information Technology in Higher Education, helps colleges and universities strengthen and improve their computing, communications, and information services, both academic and administrative. The association also helps individual members develop as professionals in the field of higher education computing and information technology.

CAUSE was organized as a volunteer association in 1962 and incorporated in 1971 with twenty-five charter member institutions. In the same year the CAUSE National Office opened in Boulder, Colorado, with a professional staff to serve the membership. Today the association serves more than 2,550 member representatives from over 875 campuses representing 662 colleges and universities, and 45 corporate members.

CAUSE provides member institutions with many services to increase the effectiveness of their computing environments, including:

- the CAUSE Exchange Library, a clearinghouse for documents and systems descriptions made available by members through CAUSE;
- the Institution Database (ID) Service, which provides to members information about typical computing practices among peer institutions from a database of member institution profiles;
- association publications, including two bi-monthly newsletters, *Manage IT* and *CAUSE Information*, the professional magazine, *CAUSE/EFFECT*, and monograph and professional papers series;
- workshops, seminars, and institutes; and
- the CAUSE National Conference.

We encourage you to use CAUSE to support your own efforts to strengthen your institution's management and educational capabilities through the effective use of computing and information technology.

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INTRODUCTION

CAUSE90 continued the high quality of professional activities that has been set by previous conferences. New on the program this year were an additional track on distributed computing and a series of focused, informal round-table discussions. The Program Committee wcrked long and hard to select what they considered the very best of 99 high-quality proposed presentations to fill the 47 available slots. Based on many informal comments and the evaluations turned in at the conference, the entire program was very well received.

If you attended CAUSE90, you heard Dr. Robert Heterick open the conference on Wednesday morning with an articulate outline of the "Challenges and Opportunities of Information Technology in the 90s," which was also the conference theme. Dr. James Wetherbe, in his Thursday morning general presentation, "Competing with Computing," called on us to emphasize "effectiveness" rather than "efficiency": Efficiency, he said, may allow you to do a task or market a product at the least cost, but you may lose the market in the process if you sacrifice effectiveness. On Friday morning, Dr. Fred Hofstetter of the University of Delaware dramatically demonstrated instructional use of information technology when he showed his audience how personal computers can be tied to CD-ROM readers, videodisk drives, musical keyboards, and projection systems to make classroom instruction and other presentations much more exciting for their audiences.

The opening reception, sponsored by Digital Equipment Corporation, was colorful and lively, as was the Thursday evening banquet sponsored by IBM. Other corporations hosted refreshment breaks, a tennis tournament, a golf outing, and a fun run along Miami Beach—as well as the new Communications Central area which provided conferees with on-site office facilities, and the Apple Computer-sponsored daily conference newsletter and conference messaging system with Internet connection. These generous corporate sponsorships are summarized on page 4. The Fontainebleau Hotel staff did an excellent job of supporting the meeting logistically, and food and facilities were outstanding.

These *Proceedings* will give conference attendees a chance to review in detail the presentations you attended, and to read papers from presentations that you couldn't fit into your schedules. Those of you who could not attend now have an opportunity to read papers that interest you at your leisure. Presentations are also available on cassette tape—see the introductory page *ii* of this book.

As the summary of CAUSE90 evaluations included with these Proceedings show, this was a highly-rated event, both professionally and socially. We thank everyone who submitted papers, convened sessions, gave logistical help in presentation rooms, chaired constituent group and other special sessions, and provided all the other visible and not-so-visible support that contribute to a successful conference. We look forward to your continued active involvement in CAUSE.

Ernie Jones
CAUSE90 Chair

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ACKNOWLEDGMENTS

The success of the CAUSE National Conference is due to the contributions of many people and supporting organizations, several of whom deserve special attention:

▲ The CAUSE90 Program Committee

Front row, left to right: George Quinn, University of North Carolina/Wilmington; Ernest Jones, Appalachian University, Chair; Ronald Moore, University of Louisville, Michael Staman, West Chester University; Thomas Gabriele, Western Michigan University; Steven Gilbert, EDUCOM; Alice Hunt, University of California/Santa Cruz. On steps: Conrad Dietz, Illinois State University; William Joseph, Virginia Wesleyan College; Jacqueline Brown, Princeton University; James Penrod, California State University/Los Angeles.

This committee, under the chairmanship of Ernest L. Jones and vice chairmanship of James I. Penrod, dedicated countless hours to produce an outstanding program at CAUSE90. CAUSE gratefully acknowledges their enthusiasm, time, and efforts, and the generous support of their institutions.

CAUSE President Jane Ryland and Program Chair Ernie Jones enjoy a CAUSE90 plenary session.

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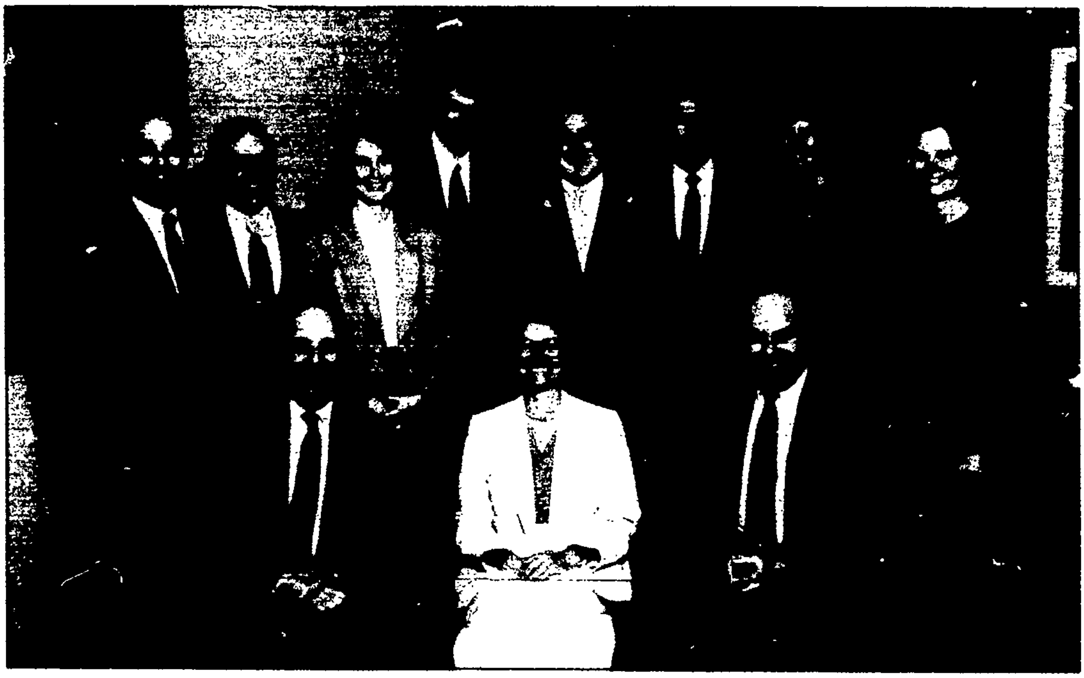
▲ 1990 CAUSE Board of Directors



Seated, left to right: Jeffrey W. Noyes, Mercer University; Vice Chair Carole Barone, Syracuse University; Arthur J. Krumrey, Loyola University of Chicago. Standing: Secretary/Treasurer A. Jerome York, University of Cincinnati; Kenneth C. Blythe, Pennsylvania State University; Diane J. Kent, University of British Columbia; immediate past chair David L. Smallen, Hamilton College; Chair Robert C. Heterick, Jr., Virginia Tech; Lee R. Alley, Arizona State University; CAUSE President Jane N. Ryland; Carla T. Garnham, Medical College of Wisconsin.

The generous contributions of time, insight, and creative energy of the CAUSE Board of Directors are gratefully acknowledged and appreciated.

Retiring from the CAUSE Board during this conference were: Carla T. Garnham, Director of Management Information Systems for the Medical College of Wisconsin; Jeffrey W. Noyes, vice president for computing and information resources, Mercer University; and David L. Smallen, Director of Information Technology Services and Institutional Research at Hamilton College and a past Board chair. Robert C. Heterick, Jr., of Virginia Tech, whose term ended in 1990, will remain on the Board in an ex officio capacity for another year as immediate past chair.

1990 Board Chair Bob Heterick (right) congratulates Tom West of the California State University System on his receiving the first CAUSE ELITE *award.*

1991 Board Chair Carole Barone assumes office during CAUSE Annual Business Meeting

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▲ CAUSE Member Committees

Neither the conference nor the other association activities could continue without the contributions of the six creative and active CAUSE Member Committees. CAUSE appreciates the time and energy contributed by the volunteers who carry out the duties of these committees.

At the Wednesday luncheon, CAUSE President Jane N. Ryland acknowledged the many people who supported the association in 1990 through participation on association committees. Plaques containing certificates of appreciation were given to the following retiring committee members:

Current Issues Committee
Dorothy M. Marshall, Columbia University
James Netherton, Baylor University
Richard Whiteside, University of Hartford

Editorial Committee
Nathanial L. Felder, Southern Illinois University
Elmer F. Hesse, Wright State University
Mark Perkins, California State University/Stanislaus

Election Committee
Carl L. Gerberich, Marist College
Roger Haigh, Vermont State Colleges
Stephen Patrick, Bradley University
William Mack Usher, Oklahoma State University

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Alice Hunt, University of California/Santa Cruz
Ernest L. Jones, Appalachian State University
William T. Joseph, Virginia Wesleyan College
Ronald L. Moore, University of Louisville
James I. Penrod, California State University/Los Angeles
George Quinn, University of North Carolina/Wilmington
E. Michael Staman, West Chester University

Recognition Committee
Wayne Ostendorf, Iowa State University
Shirley Roddenberry, State University System of Florida

▲ Corporate Contributions

CAUSE thanks all those corporations who set up exhibits, gave corporate presentations, and provided evenings of hospitality. Their contributions add an enormously valuable dimension to the conference experience. Special thanks go to

- **Apple Computer** for developing and sponsoring the CAUSE90 messaging and information system, CAUSENet; for sponsoring the conference newsletter, the *Daily CHAT*; and for providing Macintosh computers and LaserWriter IINTX printers for on-site registration needs and production of the *CHAT*;
- **Digital Equipment Corporation** for sponsoring the opening night "Bahamarama" welcome reception and the CAUSE90 Fun Run;
- **EDS** for sponsoring the CAUSE90 golf tournament;
- **The IBM Corporation** for sponsoring Thursday evening's "Carnivale Miami";
- **Information Associates** for sponsoring the CAUSE *ELITE* Award;
- **KPMG Peat Marwick** for sponsoring the CAUSE90 tennis tournament;
- **Systems & Computer Technology Corporation** for sponsoring the *CAUSE/EFFECT* Contributor of the Year Award;
- **Ernst & Young, George Kaludis Associates, Hitachi Data Systems, Wang Laboratories, and Xerox Corporation** for sponsoring refreshment breaks; and to
- **Apple Computer, Hewlett-Packard, IBM Corporation, and Xerox Corporation** for sponsoring CAUSE Communications Central.

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CAUSE90
MIAMI BEACH
NOVEMBER 27-30, 1990

GENERAL SESSIONS

CAUSE90 general session presentations encouraged conferees to examine the potential role of information technologies in higher education and their own responsibilities as professionals in that field.

On Wednesday morning, Bob Heterick—chair of the 1990 CAUSE Board of Directors and vice president for information systems at Virginia Tech—sketched for his audience the current state of higher education and opportunities for development of information technology functions in our organizations in his opening address, "Challenges and Opportunities."

James C. Wetherbe, professor and director of the Management Information Systems Research Center at the University of Minnesota's Carlson School of Management, described how computing can be used as a competitive tool in his Thursday morning plenary address.

In a special general session on Friday morning, Fred T. Hofstetter—associate provost for academic computing and instructional technology at the University of Delaware, and an IBM Consulting Scholar—illustrated some of the possibilities of hypermedia to enhance presentations for instruction and public relations uses.

The closing general session of CAUSE90 was a Current Issues Forum Friday morning in which four panelists discussed "Information Access in Academe: Is the Sky the Limit?"

Other general sessions throughout the conference allowed recognition of individual contributions to the association and the profession, and transaction of association business. The new CAUSE *ELITE* Award was awarded at Wednesday's luncheon, while Thursday's Appreciation Luncheon featured special recognition for the 1990 *CAUSE/EFFECT* Contributor of the Year Award, the CAUSE Board of Directors, members of the six association member committees and contributors to *CAUSE/EFFECT* magazine. CAUSE voting members decided on several association bylaw changes during the Annual Business Meeting at a Friday-morning breakfast.

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WEDNESDAY MORNING KEYNOTE ADDRESS

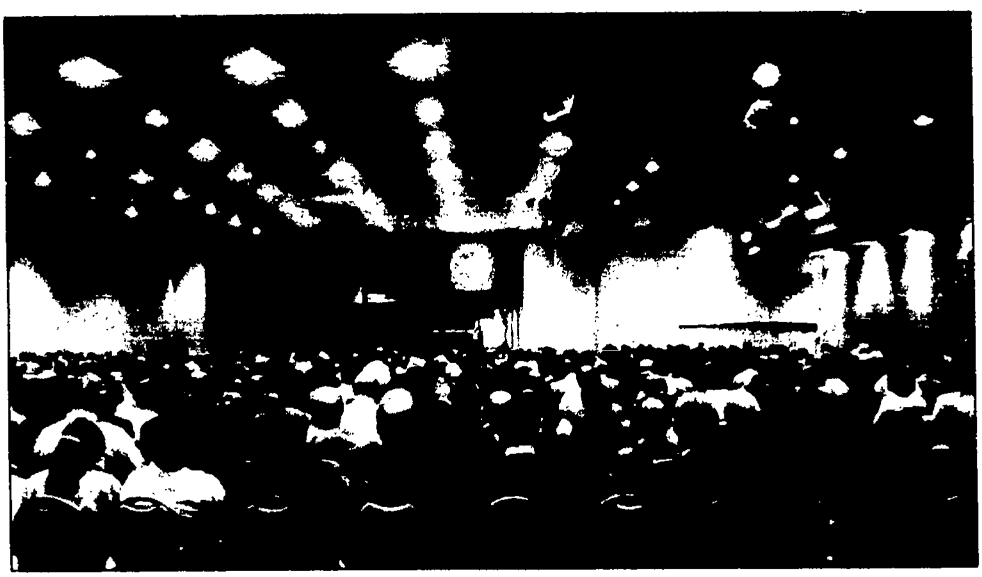
"Challenges and Opportunities"

Robert C. Heterick, Jr.

Vice President for Information Systems, Virginia Tech
Chair, 1990 CAUSE Board of Directors

Dr. Robert C. Heterick, Jr., opened the official program of CAUSE90 by summarizing changes in our campus environments over the past two decades, and suggesting ways in which higher education will have to meet new demands with limited resources. Campus and society needs for informatin have grown exponentially, while the availability of information that IT organizations offer has grown linearly. Heterick called for willingness to change—both our attitudes and our facilities—to capitalize on exciting new uses of technology.

Among the priorities Heterick foresees are universal access to information, expanded and accessible electronic libraries, and the ranking of productivity and quality of education before cost. Essential to our development, he claimed, will be new cooperation between various units of the institution to pull together the "information triad" of communications, information, and control in what may be new styles of organization.



ELITE AWARD LUNCHEON

Thomas W. West, assistant vice chancellor of information resources and technology for the California State University System, was awarded the first CAUSE *ELITE* Award for Exemplary Leadership and Information Technology Excellence at this luncheon.

The ceremony included a video presentation featuring an overview of the profession, the concept behind the new award, and comments from West's colleagues and CAUSE Recognition Committee Chair Shirley Roddenberry. In his acceptance remarks, West offered 16 axioms for information resources management gleaned from his 18 years of experience in the field.

Pictured are 1990 CAUSE Board Chair Bob Heterick, Tom West, and John Geraci, president of award sponsor Information Associates.

THURSDAY GENERAL SESSION

"Competing with Computing"

James C. Wetherbe
Professor and Director
Management Information Systems Research Center
Carlson School of Management
University of Minnesota

In Thursday morning's general session, Dr. James C. Wetherbe emphasized to his audience that effectiveness, rather than efficiency, should be the focus of information systems. Feedback is essential to encourage effort, as he illustrated with examples from sports, industry, and personnel management.

Wetherbe defined three major response strategies that allow corporations and organizations to maintain competitive advantage: (1) low cost leadership, (2) differentiation of services, and (3) focus on value of niche. Cost leadership, often the most obvious, is also the riskiest. The other two strategies—differentiation and niching—are areas where IT can offer real competitive advantages. Wetherby challenged listeners to find ways information technology can allow them to give their customers what they want "any time, any place, any way. Our challenge is to keep our technique ahead of technology."

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APPRECIATION LUNCHEON

Thursday's Appreciation Luncheon featured recognition of special contributions to the association by members of the Board of Directors and the member committees, authors of articles in *CAUSE/EFFECT* magazine, and the winner of the 1990 *CAUSE/EFFECT* Contributor of the Year Award.

CAUSE/EFFECT Contributor of the Year

William J. Kettinger, assistant dean for information and technology resources at the University of South Carolina's College of Business Administration, received the 1990 *CAUSE/EFFECT* Contributor of the Year Award for the best contributed paper published in the magazine in the past four issues. His winning article, "The Decentralization of Academic Computing: Defining Future Roles," appeared in the fall 1990 issue. Systems and Computer Technology Corporation has sponsored the award since 1982. Pictured above are Michael J. Emmi, Chairman and CEO of SCT, Kettinger, and 1990 CAUSE Board Chair Bob Heterick.

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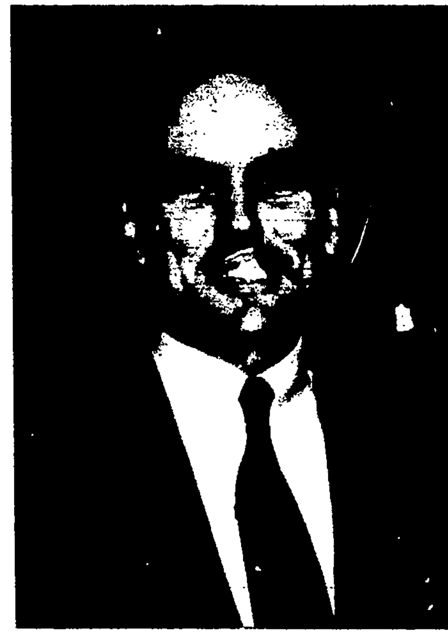
APPRECIATION LUNCHEON

INTRODUCTION OF 1991 CAUSE BOARD

***1991 Officers:** front row, left to right: Secretary/Treasurer Kenneth C. Blythe, Pennsylvania State University; Chair Carole Barone, Syracuse University; Vice Chair A. Jerome York, University of Cincinnati. **1991 Board:** standing: newly-elected member Leslie Maltz, Stevens Institute of Technology; Diane J. Kent, University of British Columbia; Lee R. Alley, Arizona State University; Immediate Past Chair Robert C. Heterick, Jr., Virginia Tech; CAUSE President Jane N. Ryland; newly-elected member Joanne R. Euster, Rutgers University; Arthur J. Krumrey, Loyola University of Chicago. **Not pictured:** newly-elected member Ronald Bleed, Maricopa Community Colleges.*

FRIDAY MORNING GENERAL SESSION



Fred T. Hofstetter
Associate Provost, Academic Computing and Instructional Technology, University of Delaware
IBM Consulting Scholar

This special Friday morning general session demonstrated the power and potential of multimedia and hypermedia for effective presentations in administrative as well as instructional settings. Dr. Hofstetter based his presentation on the interactive videodisc program, PODIUM, which he developed. The session drew on his expertise in multimedia computing for music composition, desktop publishing, interactive video, compact disc, handheld scanning, and computer-based instruction.

CURRENT ISSUES FORUM

Ken Blythe
Director
Management Services
Pennsylvania Sate University

Nancy Cline
Dean
University Libraries
Pennsylvania State University

"INFORMATION ACCESS IN ACADEME: IS THE SKY THE LIMIT?"

This closing general session of CAUSE90 explored the culture clash on campus over such issues as security, privacy, censorship, and the philosophy of "free access."

In a discussion moderated by CAUSE President Jane N. Ryland, the four panelists expressed concerns representing the perspectives of very different responsibilities on campus—

- an administrative systems view of the "client-centered process" of information access in academe and its concerns for privacy, confidentiality, and security;
- library concerns such as copyright, intellectual property rights, and financial support policies;
- an academic perspective focusing on how shared network access to information blurs traditional cultural distinctions on campus; and
- legal restrictions on access from historical and jurisprudential points of view.

M. Stuart Lynn
Vice President
Information Technologies
Cornell University

Patricia McClary
Associate University Counsel
Cornell University

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CAUSE90 MIAMI BEACH NOVEMBER 27-30, 1990

PROFESSIONAL PROGRAM

The CAUSE90 theme, *Challenges and Opportunities of Information Technology in the 90s*, was addressed through 47 professional presentations in eight subject tracks, as well as through many other professional development opportunities. Six Current Issues Sessions allowed conferees to converse about subjects of topical interest. Three Ask the Experts sessions brought participants together with experts from education and industry to discuss complex current technologies, and three new, limited-participation Round Table discussions focused on seminal questions facing our profession. Twelve Constituent Groups met to exchange information and experiences pertaining to specific working environments.

Printed in the following pages are summaries of the Current Issues, Round Table, and Ask the Experts sessions and and Constituent Group meetings, along with papers from the professional presentations categorized according to the eight conference tracks.

CAUSE gratefully acknowledges those individuals who agreed to present professional papers on a moment's notice. Although they were not called on to present, their papers are included in this book.

Current Issues Sessions

Six Current Issues Sessions provided informal opportunities for conferees to meet and exchange ideas on topics of special interest or concern. The topics were chosen from issues which have been of interest to the profession in the past year.

Managing Computing Personnel in the Midst of Rapid Change
Moderator: Dorothy M. Marshall
Columbia University

What Can Central Computing Do to Foster Classroom Computing?
Moderator: Barbara Wolfe
Southern Methodist University

Campus IT Organizations: How Successful Are Mergers?
Moderator: J. Patrick Casey
Indiana University

Coping with Aging Administrative Systems
Moderator: Gene T. Sherron
Florida State University

Is Outsourcing a Solution for Higher Education?
Moderator: Robert Robinson
Oakland University

Charging for Computing and Network Services: A New Utility
Moderator: Fred Harris
University of Iowa

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Managing Computing Personnel in the Midst of Rapid Change

Moderator:
Dorothy M. Marshall
Columbia University

To introduce the topic for this session and to stimulate discussion, we opened with a discussion on our roles as management and as change agents.

It was generally agreed that information systems/technology management does not recognize the impact that change has on the staff reporting to it. Particularly identified were the areas in maintenance and support functions where the staff is caught with having to "retool" while the work load grows. Some attendees felt very frustrated about the difficulties of introducing staff to new techniques while their management wants "more, faster, and with fewer people."

There does not seem to be a literature on managing change, in a practical sense, on which middle management can rely. All seemed to agree that wholesale retraining is not fiscally possible and would provide only mixed results.

There was agreement that skills sets are changing and that basic work needs to be done on redefining position descriptions and organizational structures within the information technology organization.

This discussion group was very well attended in spite of sunny beaches and the end of a very full day. It is a topic that has immediacy and would benefit from broader discussion.

What Can Central Computing Do to Foster Classroom Computing?

Moderator:
Barbara Wolfe, Southern Methodist University

The microcomputer has become a very powerful tool in the past ten years, yet its use in classroom teaching seems to lag behind its use as an individual productivity tool. Classroom computing refers to all computer use in the instructional process. As information technology experts, we do not control the curriculum in higher education. The faculty of our institutions have curricular ownership. Consequently, we are limited in influencing what happens in classrooms in higher education.

Historically, the Fortran programming language was the first use of computers on any widespread basis in higher education. It became the preferred tool of scientists and engineers until, by the mid-1970s, almost all science and engineering programs required demonstrated proficiency in Fortran. Thus, it was used as part of the instructional program beginning in graduate programs and quickly migrating to the undergraduate curriculum. This was followed by what were called "canned" programs specific to subject areas—statistics, engineering, simulation, graphics, primitive word processing which was then called text processing, data base management, and computer-assisted instruction.

During the 1980s the microcomputer largely subsumed the "canned" program and provided increased capabilities through its graphical user interface and predictable response times. It is fair to assume that the microcomputer and its larger version called the workstation are the preferred media for today's instructional computing.

Many different means have been tried to get faculty interested in using computers in instruction. Informal contacts with faculty are useful if you are open to hearing their needs and can respond with creative suggestions that minimize the work that they must do. You can nurture these "eagles," provide them with recognition, and support their efforts. However, one must be alert to the necessary time commitment of such faculty for developing instructional materials and the institutional reward structure for tenure. A junior faculty member in a tenure track position should not be encouraged to be an "eagle."

A more formal approach through structured groups is useful. Generally, a senior information technology officer has a computer policy and planning committee which is used to endorse directions for instructional support. In addition, an operational group can be identified from the colleges and/or departments who can speak for the implementation of computing in these units. Regular meetings with these groups can be quite useful in promoting and developing interest and support for the use of computing in the curriculum. Some institutions may have a media center or an instructional technology committee wherein close alliances may yield large benefit.

Competition for hardware and software awards and grant programs through submission and evaluation of proposals can generate interest not only from faculty

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submitting proposals but also from faculty doing the evaluation. These awards can be purchased from pooled institutional funds, and vendors are usually cooperative in leveraging these funds for institutional advantage, often with additional donations. Sometimes, with strong proposals and appropriate vendor recognition, awards can be obtained from vendors without charge. Vendors also have programs for loaning equipment and software, often for limited time with continuation dependent upon software development.

Classroom computing can be fostered by structuring services and organizations which are useful to faculty in developing instructional software and in delivering that software for student use; having staff that are competent in instructional design methodology, providing in-depth assistance with standard computing packages where instructional material can be supplied as "data"; and having a set of "tool kits" which can be used in programming and in using standard packages. After software is developed, providing computing laboratories, equipment and software maintenance, and installation and setup services facilitates delivery of instruction.

In some cases, hiring faculty with joint or summer appointments in the central service organization can foster the interchange of information and skills about computing and instructional technologies. Often problems arise in controlling salary dollars and coordinating work objectives, but the opportunity should not be overlooked if the situation is appropriate.

Other suggestions that were discussed included changing the incentives for faculty for improving teaching, lengthening teaching assignments for courses to several years so that faculty can realize some personal rewards for improving instruction, providing released time for faculty to learn new skills and develop software, and providing a technology laboratory for the exclusive use of faculty.

Campus IT Organizations: How Successful Are Mergers?

Moderator:
J. Patrick Casey, Indiana University

As colleges and universities increasingly conclude that information technology is vital to their institutional mission, attention often turns to organizational structures. Should academic and administrative computing be merged? What about telecommunications? What about the libraries? What about video and reprographic services? Do the benefits of competition outweigh those of coordination? What are the "win-win" strategies?

At this session, IT managers were asked if all the attention paid to organizational structures were not somehow missing the point. Patrick Casey from Indiana University suggested that there was no single solution to this question, but rather a series of "right answers" depending on institutional environment, process of selecting an organizational model, and personnel. Dozens of participants from small and large schools, public and private institutions, merged organizations and separate ones, attended this session and engaged in a lively discussion of how to make "form follow function."

Mark Olsen from Columbia noted that his institution had merged academic computing, administrative computing, and the libraries just a few years ago, and had recently "unbundled" these functions once again. Jim Haskett from Central Washington University suggested that the key issues had to do with what the senior management of an institution wanted. In general, it was felt that "turf issues" too often complicated the question of how to achieve less duplication of services. Most participants agreed that the trend towards distributed computing, information, and network systems complicated rather than simplified these questions.

Generally, smaller institutions seemed to find that economies of scale tended to dictate merged organizations for their environments. A straw-vote poll conducted during the session indicated that virtually all institutions represented had, at present, unified networks (at least from the point of view of a single wire plant serving both administrative and academic users). Roughly a third said that administrative computing, academic computing, and voice communications fell into a unified reporting structure at their institutions. Interestingly, virtually all felt that their organizations *WOULD* have such unified reporting structures within the next three years, with many citing the network as a great unifying force at their institutions.

There was no agreement among the participants as to any single "best" solution. It was generally agreed that, in those cases where mergers had been effective, service needs were often viewed as the starting point. These service needs should dictate application architectures, network architectures, hardware architectures and, finally, organizational plans. It was also agreed that, in the best cases, questions were asked regarding the particular needs of an institution, its goals, its existing infrastructure, its areas of existing strength and weakness, its unique opportunities to build. As one participant summed these matters up, "everything is possible in an environment of trust."

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Coping with Aging Administrative Systems

Moderator:
Gene Sherron, Florida State University

This session began with an introduction to the topic along the lines of the old/new saying, "Old systems never die; they just age us." One reason this is so is that we feel that the 80/20 rule applies to the problem. Generally, we spend 80 percent of our resources maintaining old systems and only 20 percent of our efforts go into new systems.

Tom James, Director of Administrative Information Systems at Florida State University, opened the session with an overview of problems and challenges associated with trying to "modernize" some of his "well aged" systems.

The FSU direction involves seven basic initiatives. These include: developing a comprehensive, university-wide data model, communicating to all management levels that an IBM framework has been adopted, facilitating end-user commitment to 4GL tools, establishing university IS priorities, fostering communication between systems staff and end-users, actively encouraging and assisting end-users in the development of IS plans, and giving IS staff opportunitie· to gain experience with relational database technologies.

Don Heller of MIT's Administrative Systems Development said they have taken a "re-engineering" approach to replacing old systems. MIT realized that:

1. Users will always be resistant to change. But they are willing to change and even participate in the design of a new system when they see systems people work to support the users and give them "business functionality."
2. The technical architecture is antiquated. Nineteen of twenty applications were home-grown without any grand design.

Yale's Carol Woody, who heads up Financial Systems Development, promotes "constructive evolution" to migrate from the old to the new. We all face pressing business needs and must employ improved technology to lower the cost of administration. However, this requires a team effort with the functional user/manager guiding the systems staff toward improved applications. She, too, found the James Martin 80/20 rule alive and well at Yale. In this case, she found that 20 percent of the program caused 80 percent of the problems. So she and the user/manager redesigned the 20 percent first, which freed up resources to work on the new system.

At the Citadel, Director of Information Resources Management Rod Welch made the heroic switch from a totally remote batch system to a brand new campus system of new hardware (VAX cluster) and packaged administrative systems (Information Associates). This was a $2 million project that spanned '86 to '90. Key to keeping the programming staff small was the top management directive that no change could be made to the packaged software unless ALL members of the user committee agreed. Users were also quite pleased with "do-it-yourself" 4GL tools like FOCUS as their on-line query tool and report writer.

In sum, if you've got a campus with aging systems, you've got a lot of company. And the strategy for change tends to be evolutionary rather than revolutionary.

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Is Outsourcing a Solution for Higher Education?

Panelists:
Ron King, Director of Education Marketing, EDS
Mike Staman, Associate Vice President, West Chester University
Bob Robinson, Executive Director of Information Services, Oakland University

Outsourcing was defined by panel leader Bob Robinson as a process of acquiring operating services or resources from external sources. It was viewed for purposes of the discussion as a continuum running from in-house provision to facilities management.

Ron King presented a position supporting active outsourcing of university data processing services, concentrating on the end of the spectrum closest to facilities management. He noted an increase in outsourcing from 2 percent in 1989 to a forecast 20 percent by 1993; indicated that institutions are best able to manage and plan technology by using all the tools at their disposal, and outsourcing to acquire resources and talent is one tool; and pointed to a trend toward CIOs with less technical strength but more focus on the strategic value of IT to the enterprise and its relationship to the core issues. He outlined qualifications of competent providers, focusing on strengths tied to size. He indicated that cost is not a useful driver, as focusing on it often masks strategic issues drivers, of which competitiveness is a key one.

Mike Staman presented a position supporting greater reliance on internal strength, noting that retaining and building technical skills is commensurate with the fundamental purposes of the institution. He indicated that outsourcing in general is a viable management tool and strategy but that maintaining management control is essential, and that typical FM contracts extend too far in this regard.

Bob Robinson reviewed the outsourcing of IBM cycles and partial technical and operations support being utilized at Oakland. He noted that strategic issues served are: effecting a transition to purchased MIS software, simplifying a conversion from DOS to MVS, avoiding a temporary staff buildup, stabilizing the management of computing, and paving the way for potential later return to in-house services if financially attractive.

A lively audience discussion ensued on several questions:

• What factors to look for in determining outsourcing potential?

Responses: (1) lack of technical depth, (2) constraints due to head count limits, (3) desire for consolidation of effort to a manageable unit, (4) need for support during technical transition, (5) user demand for specialty work, (6) need for a piece of a "big box."

• What benefits/detriments might be expected?

Responses: (1) loss of control, (2) simplification of management may yield more focus on strategy, (3) improved accountability, (4) permits magnitude shifts in activity, (5) may support closer links with the user, (6) may not like provider's strategy in the long term, and thus inflict re-conversion on users, (7) the analysis may itself be a catalyst for change.

• What management challenges exist?

Responses: (1) time!, (2) procrastination, (3) contracting skill requirements, (4) people skills during the transition.

Charging for Computing and Network Services: A New Utility

Moderator:
Fred H. Harris
Associate Vice President and Director
Office of Information Technology
The University of Iowa

Computing, information systems, and network support units face expanding service demands and opportunities in an environment of tighter and tighter budgets. Consequently, the issue of charging user departments for services, commonly referred to as "chargeback," continues. Is chargeback an effective way to allocate resources and balance supply and demand for services?

The moderator of this session briefly highlighted applicable economic theory and related perspectives—basic terminology; strategy, policy, and process considerations; issues of supply and demand; criteria for effective pricing; different cost components—and identified rationales for different pricing levels.

Participants represented institutions ranging from small liberal arts campuses to major public research universities. They also represented the full spectrum of charging practices, including the extremes of all "free" services (the public good or library model) and total cost recovery through charges for essentially all services (the bookstore model).

The possible impact of charging for important academic services on academic freedom and the pursuit of informed inquiry was the overriding concern of several participants. Other major concerns about institutional policies and practices on charging for services included equity between the "haves" and "have-nots," the impact of tight budgets and inadequate resources, and the level at which tradeoff decisions are made (central administration, service unit, or end user). Strategic versus operational perspectives are creating pressure to change existing practices.

It was generally agreed that charging policies and practices for computing and telecommunications services should be more closely (explicitly?) linked to institutional strategic planning and related priorities. Here as in other contexts, the grass seems to be greener on the other side of the fence, and a number of institutions said their existing practices are under review. Perhaps computing service pricing models can be thought of as a mix of strategic services available at no charge (free), tactical services charged at marginal costs, and operational services charged at full costs.

The moderator closed the session with the following advice: look at choices through both sides of the keyhole—things are not always what they seem to be from a single viewpoint. Know who's keeping score for what purposes, and try to make the scorecards match their agenda(s). Consider both internal and external options in evaluations. Remember that equity and fairness are "in the eye of the beholder."

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Round Table Discussions

New this year, these three working round tables were small interactive "brainstorming" meetings to allow colleagues to share experiences and ideas. Participation was limited to 25 people, on a first-come basis.

Coping with Budget Cuts and Downsizing

Discussion leaders:
Ced Bennett, Stanford University
Kenneth Klingenstein, University of Colorado/Boulder
James May, California State University/Chico
M. Lewis Temares, University of Miami

Bridging the Gap between Central and Departmental Computing

Discussion leaders:
Neil Armann, Arizona State University
Marianne Elser, University of Michigan
Jerry Sanders, Loyola University of Chicago
Stu Warford, Pepperdine University

Metrics for Information Resources: Has the Time Come?

Discussion leaders:
Lee Alley, Arizona State University
Fred Harris, University of Iowa
Thomas West, California State University System
Michael Zastrocky, CAUSE

Coping with Budget Cuts and Downsizing

CAUSE90 Round Table Discussion

Cedric S. Bennett, Stanford University
Kenneth Klingenstein, University of Colorado/Boulder
James H. May, California State University/Chico
M. Lewis Temares, University of Miami

The meeting opened with brief statements by each moderator. Each outlined recent budget cutting processes that had taken place at their institutions and provided some insights into the methods and approaches that had been used for "coping."

Bennett described the internally-developed guidelines and process used to cope with a current eighteen-month Stanford University-wide "repositioning" process started in early 1990 and designed to reduce the administrative portion of the University's General Funds budget by \$22M (out of \$175M). The idea behind "repositioning" is not just to cut budgets but to examine all administrative functions, programs and processes to see if they can be redesigned, reduced or eliminated. University-wide *repositioning principles* were designed to guide the process. Some of those principles are: simplification of process; support of the University mission; preservation and enhancement of pluralism; consultation with clients; **repositioning, not just budget cutting.** The Data Center organization extended this list even further to include: services are allowed to change; risk-taking can increase; recent decisions (about new programs) are often the best decisions; building the future is fundamental; cut work **and** workload; **advice of, and to, our staff is critical**; and, the *Golden Rule* is applicable (don't shift work to another place to save money unless you are prepared to get some back).

May described a state-wide process in the California State University system, and its effects on the Chico campus, in which budgets are not being cut, but are being reduced by elimination. A recent memo from the governor of California prohibits spending general funds on hiring new employees; ordering, leasing, or purchasing of equipment; and entering into, extending or amending any consultant or personal services contracts—in other words, a budget freeze. California also had recently reduced the central system budget by approximately \$4M and redistributed most of those funds to the campuses. The introduction of the lottery in California was supposed to fund new project work in education, but it appears that most of those funds are being directed toward day-to-day operations. Furthermore, the general malaise of the economy has reduced total lottery revenues. The effect of this has not yet been dealt with in the system. In part, this campus has been very successful at redeploying funds to cover the highest priority activities.

Klingenstein focussed on the process that his campus had used to cope with budget cutting and the realities that this activity revealed. One lesson was that prioritization of activities showed that the lowest priority activities were also the least expensive to operate (and therefore the least contributory in a budget cutting effort). Also **consultation with clients** is essential to define the "*untouchables*" and to determine those ideas that simply won't work if implemented. Some services must either be maintained at a certain level or be eliminated. An examination of the real business showed that the organization had become a provider of services and information rather than of computing cycles; the object lesson was to cut cycles, if in doubt. The dilemma and tension of whose interest to protect—the University's or the department's—was always an issue. The advice was to opt in favor of the larger entity. They also decided to attack capital budget assumptions and use it to fund more costly and more effective current operations. A policy was adopted that all donations must be fully costed

before they can be accepted. Software revisions are being done less frequently than their availability. They have adopted a policy of using off-the-shelf software instead of local development. They are very careful about recharging. Final advice was to **avoid** the *apple pie* syndrome, wear your budget cuts on your sleeve and to cut more than necessary and then do reallocations (it changes the tenor of discussion of the discussion if folks see that it is possible to **gain** budget in the process).

Temares focussed on succeeding under budget constraints. He urged that one must always plan for budget cuts. His advice was to learn and understand the fund accounting process and use that knowledge to advantage. For example, it may be possible to save one-time dollars (in depreciation or plant funds) during the good times so that they are available to be used to solve budget problems in the bad times that will inevitably arrive. Remember that most budget problems are often just reallocation problems (therefore, proper positioning within the University with other University executives may indicate that some departments do not have budget problems — "*The real institutional goal is **not** for less computing*"). Staff must be involved; they will often have very good ideas for creating real budget savings (e.g., some staff volunteered for leave without pay, others discovered money saving ideas for printing). Fight cuts with data; never think that you have to take the cut. Look for alternative revenue sources (but be very careful about legal issues). "*Always be prepared (the Boy Scout's motto) is good, . . .there will always be a budget cut tomorrow. The good times are not tomorrow—the good times are today.*"

There was considerable discussion among the round table participants after the moderators had finished speaking. In answer to the question, "Is anyone here facing budget cuts" there was almost unanimous agreement. The round table managed to discuss several other related topics at some length, including:

- Layoffs and terminations.
- Having to cut budgets "immediately" or during the middle of the budget year.
- Looking at other ways to raise revenues both for computer centers ~nd for the University as a whole. Examples discussed were:
    - selling computer time and other center services
    - fund raising that is specific to high-tech
    - debit cards for students
    - cable TV in dorms
    - copy machines for personal use
    - long-distance telephone
    - student fees (instead of charging directly for services)

    [It was noted that there are significant potential risks of Unrelated Business Income Tax and Town/Gown relationship issues regarding unfair competition—particularly in state-supported institutions. Another danger of long-term subsidy of internal functions by external revenues can be that it can negatively affect ability of the computer center to replace aging technology. There are also risks, and often restrictions, regarding the use of student fees.]

The two most consistent themes expressed during this round table were (1) the importance of keeping clients in the budget- cutting information loop and (2) the critical necessity to both listen and learn from all the staff within the organization and to keep them informed about progress.

Bridging the Gap Between Central and Departmental Computing

CAUSE90 Round Table Discussion

Discussion Leaders:
Stu Warford, Pepperdine University,
Mary Ann Elser, University of Michigan
Neil Armann, Arizona State University
Jerry Sanders, Loyola University of Chicago

Education

While computing was centralized, there were some time-honored, tradition-bound processes that were the job of the central Information Technology (IT) responsibilities. As we have decentralized computing, often we have not worked with departmental managers to decentralize these responsibilities. Departmental managers must become aware of their responsibilities for such things as security, system backups, system utilization, planning, and the like. Departmental managers have become, in essence, computing managers, but often don't want to see themselves as such. At Pepperdine we have a course offered through our Information Center specifically geared to departmental managers regarding these issues.

Departmental Planning.

At the University of Michigan, there are four senior planners and two staff planners, who act as a conduit between the central IT structure and user departments. These planners represent the departments within central IT, share central IT information with the departments, and manage computing-related projects. There are several limitations to this position, however. Often, this position lacks credibility, since they only exhibit influential power in many processes. For example, the planners do not have direct control over any funding decisions. They can make recommendations, but all funding for projects is decided on by the departmental management or central IT. Turnover of departmental planners requires lengthy reestablishment of relationships. And departmental management often become too dependent on these departmental planners. At U of M, the departmental managers are funded and report to the central IT organization.

Liaison Groups

Arizona State University has a "marketing unit" in IT that serves much the same kind of function as the departmental planners at U of M. We first tried to do this with a centralized "consulting group" which didn't work too well, so they took several of their consultants and converted them into a "liaison group." This was effective for three or four years and departmental feedback was good. However, there has been an evolution since then. A drastic increase in technology application on campus without a commensurate increase of staff in local support placed too much pressure on this liaison group. Thus departments were not being as well served, and soon sought out their own technical staffs. Centralized IT has since disbanded the liaison group and now depends on these departmental technical liaison staffs. In an effort to get rid of

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this "central vs. decentral" designation and work together, centralized IT is in the process of creating a "computing consultants cooperative" composed of these departmental liaision staffs and the central IT staff to share expertise, provide identity (human networking), and set standards. These departmental liaisons are also recognized by centralized IT as local experts which are given preferred service.

Departmental Computing Coordinator

Loyola University of Chicago's Information Center (IC) has developed a "standard accountability" statement which is used by departmental units for inclusion in job descriptions of technical employees (Departmental Computing Coordinators [DCCs]). They use a statement which can be included in a job description rather than a job description itself for flexibility. This statement includes the percentage of time spent on computing, the importance the position has on departmental operations, and other measures. One of the functions included in this accountability statement is that employees are responsible for representing computing policies and procedures to the departments in which they work. The program has been operational for a couple of years but is not mandated. The centralized IC usually nominates staff in the departments who will participate in this job statement.

What is the incentive for a department to incorporate this statement into the job description for one of its employees?

1) Often the employee is doing the work anyway, and this statement normally leads to appropriate compensation for them.
2) This provides a standardized way of describing the function in the department.
3) Centralized funds are given to the IC for the training of DCCs.
4) a LAN will not be given to a department without a DCC (although this has not been tested yet).

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Metrics for Information Resources: Has the Time Come?

CAUSE90 Round Table Discussion

Discussion Leaders:
Lee R. Alley, Arizona State University
Robert G. Gillespie, Gillespie Folkner & Associates
Fred H. Harris, The University of Iowa
Thomas W. West, California State University System
Michael R. Zastrocky, CAUSE

To open the session, Fred Harris shared his recent difficulty when, in both an accreditation review and the (unrelated) development of a strategic plan, he was unable to find or establish any generally agreed-upon, i.e. standard, metrics for meaningful, consistent comparisons of computing organizations and their operations. Although the case for correcting this lack remains to be made, has the time come to do so?

Mike Zastrocky, addressing relative comparison among institutions, stressed the need to develop critical ratios analogous to those used in financial reporting and analysis. Such ratios can be well defined, and then guidelines developed from experience for interpretation within ranges of value. Unfortunately, he continued, our currently-gathered data is just not in the shape necessary to do so and, as a group, we don't have the tradition of defining what we do in quantitative ways. The challenge before us is a significant one, and it will be necessary to work together to develop the metrics necessary to justify our demand for resources in the face of tighter budgets.

Lee Alley highlighted the findings of his conversations with numerous university presidents and provosts, all of whom had two basic questions of overriding interest—how does my institution compare with peer institutions, and how do we compare with the way we used to be? The traditional role of CAUSE in providing comparative information was highlighted, and he stressed that if we didn't provide it, someone else would. The basis for this mandate includes accountability to bottom line outputs, the need to assess the diffuse activities across the institution, the need to sort out the growing spectrum of computing and computer-related activities, and impatience with our "immeasurability" under intense competitive pressures.

Bob Gillespie identified the four purposes of metrics as evaluation, justification, placement, and guidance, and he shared his historical perspective on data collection activity that grew out of the Snowmass Conferences. He stressed the difficulty in understanding the basis for others' numbers. Moreover, in his experience, achieving closure (in definitions and interpretation) among different institutions is very difficult, and changing the underlying strategy for budgeting is very risky.

Tom West, avowing a "devil's advocate" role, said he had "had it" with metrics. What are the purposes of metrics? Make a case for budget? Measure efficiency? Or program effectiveness? In the absence of budget increases, why fool with metrics? And as a "plumber" concerned with the infrastructure, questions of efficiency and effectiveness are issues for the faculty and line people responsible for the product.

Major points abstracted from the ensuing roundtable discussion are as follows:

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- Metrics are invariably applied in win-lose situations, and an accreditation process is needed for metrics.

- Unfortunately, as in the case of libraries, existing (well-defined, accredited, faculty-supported) metrics are in the way of breaking or changing the existing culture.

- Metrics for quality of service, such as the length of lines, turnaround time, or terminal response time, have been used by many, albeit informally, and what's missing is the common definition and general applicability.

- Typically metrics for other sectors have been externally imposed but professionally developed and maintained, and that will happen to us. Every state system, for example, invariably employs a comparative budgeting process, and fledging efforts were identified.

- Input metrics that drive infrastructure, resource metrics that define the infrastructure, and outcome metrics associated with academic programs are all relevant. However, more work is also needed on defining the questions which the desired metrics are intended to answer.

- CAUSE should take an active role in defining metrics for higher education. The CAUSE ID surveys can provide the data, and Lee Alley offered support staff to assist Mike Zastrocky and his staff in a pilot project to determine useful metrics.

Ask the Experts Sessions

Six Current Issues Sessions provided informal opportunities for conferees to meet and exchange ideas on topics of special interest or concern. The topics were chosen from issues which have been of interest to the profession in the past year.

CASE Technology on Campus: The Management Issues

Sandra Dennhardt, Northwestern University, moderator
Michael Danziger, Deloitte & Touche

Client/Server Architecture

A. Jerome York, University of Cincinnati, moderator
Grey Freeman, Gartner Group, Inc.

ISDN—What to Expect from Industry

Roger W. Haigh, Vermont State Colleges, moderator
Morris Westerhold, Ameritech Services
Norman Doyle, Apple Computer
Les Eastwood, AT&T Network Systems
Laurent Delifer, Digital Equipment Corporation
Tom P. Hunter, IBM Communications Systems

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CASE Technology on Campus: The Management Issues

CAUSE90 Ask the Experts Session

Expert: Michael Danziger, Senior Manager, Deloitte & Touche

Michael Danziger presented an overview of a lifecycle for introducing CASE technology into an Information Systems Organization. He identified four phases for this life cycle:

- planning for CASE
- selecting CASE tools
- adapting CASE
- using CASE

During the planning phase, the organization must decide what direction is to be followed with CASE technology; for instance, providing CASE tool support for systems analysis versus full system lifecycle support. The technology used by CASE tools must be identified and the implications of using that technology must be seriously considered. The I/S organization must be committed to change. And the selection and introduction of CASE tools should be formally identified as a project, with project management.

The selection phase begins with establishing the criteria against which the various CASE tools are to be reviewed: hardware requirements, integration of tools, types of system development, documentation requirements, support and training, and the overall direction of the CASE tool. Then the CASE candidates should be identified, evaluated, and a selection made. The last step of the selection phase is planning for the introduction of CASE into the organization.

In the third phase, Michael Danziger stressed the need to "adapt" CASE technology to the organization's environment, instead of "adopting" CASE. Methods used for system development, standards and measures of productivity should be established first. Training appears to be most successful when conducted "just in time," rather than when using an avalanche approach.

Implementation of formal CASE administration is essential to successfully accomplishing the fourth phase. CASE administration provides productivity measurement, facilitates cultural changes, ensures effective communication, and assesses vendor support, as well as providing support and guidance in the usage of the CASE tools.

The following questions and answers followed the overview presentation:

1. How should productivity be measured? Whatever the measurement technique, it should indicate how well the work plan is followed.
2. Please elaborate on the characteristics of CASE administrative responsibilities. The CASE administrators need to be formally recognized and given authority to accomplish their responsibility. The CASE administrator may be the former chair of the selection committee.
3. How do we handle CASE technology within a decentralized I/S organization? This is difficult—a central standards group is necessary.
4. What about a large project for the CASE pilot project? A larger project would have some risk. The bottom line is good project management.

Client/Server Architecture

CAUSE90 Ask the Experts Session

Expert: Grey Freeman, Gartner Group, Inc
Moderator: A. Jerome York, University of Cincinnati

Grey Freeman of the Gartner Group provided an overview of the client/server technology that is evolving in today's marketplace. It has not evolved as a result of a strategic initiative by either customers or vendors but, in fact, has resulted from the PC and more powerful technology which has been developed. This is one case where the technology has driven the strategy rather than the strategy or application embracing the technology.

Grey provided an overview of the various generations of computing architectures along with some projections of where we might land by the year 2000. He then discussed the various components of client/server and attempted to clarify the various terms now in vogue. He emphasized the roles of both the servers and the clients and also strongly emphasized the value of the graphical user interface. Grey made it clear to the audience that there are very significant benefits to client/server architecture and that Gartner believes that client/server will begin to emerge as a dominant production design in 1993. The operative phrase of Grey's presentation was end-user empowerment, and he led the audience through a cycle of centralization and decentralization of technology and the organizational support. The conclusion of that cyclic evaluation was that the next systems generation will force IS organizations to become functionally rather than technically defined.

There was a very good attendee turnout and a number of questions were asked regarding the concepts of client servers and also specific questions regarding Gartner's assumptions and predictions.

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CAUSE'90 Ask The Experts Session on ISDN

Participating experts:

Laurent Delifer, Corporate Backbone Network Marketing Manager, Digital Equipment Corporation

Norman Doyle, Senior Research Engineer, ISDN and Broadband Communications Research, Apple Computer, Inc.

Les Eastwood, Manager, ISDN Applications, AT&T Network Systems

Tom P. Hunter, Senior Planner, ISDN Systems and Market Planning, IBM Communications Systems

Morris Westerhold, Senior Director, New Product Development, Ameritech Services

Roger W. Haigh, Director of Computing Services at the Chancellor's Office of the Vermont State Colleges served as session chair.

Introduction

ISDN (Integrated Services Digital Network) is not a new idea. It has been discussed since the 1970s although the first standards did not emerge until 1984. Those initial standards were followed by prototype products and the revision and extension of the standards. Recently ISDN has been receiving more attention in the technology media as new products reach the market.

The principal features of ISDN are:

1. ISDN is based on international standards. This assures compatibility of equipment from different vendors and reduces risk of investing in dead end technology.
2. ISDN provides complete end-to-end (i.e., user-to-user) communications.
3. ISDN is a completely digital network. This means that it is inherently simpler without digital-analog-digital translations, which in turn, means both a lower error rate and cost. However, full savings will not be realized until economies of scale have their full impact.
4. ISDN is ubiquitous. It is (or will be) available everywhere there is a phone jack.
5. ISDN is a switched service. Like a voice phone conversation, an ISDN data communication "conversation" is temporary, avoiding the cost of dedicated lines.
6. ISDN supports voice, data, and video communications.

ISDN in the 1990s

In the mid-1980s when ISDN standards work had just begun, the idea of ISDN was oversold. Products emerged slowly and customers became skeptical. Indeed, customer attitudes towards ISDN are still ambivalent today. Some say ISDN is too little, too late, while others consider it to be the inevitable telephone system of the future. While ISDN's future in Europe may be assured by government support, this is not necessarily the case in the USA where customer acceptance will be important.

Today, standards are complete (except for Broadband ISDN), new products are being announced and vendors are committed.

Experts expect ISDN to replace modems as the wide area data transport service of choice by the mid-1990s because ISDN is more reliable and cheaper. It also provides more bandwidth and provides it on demand.

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ISDN is not constrained by the kinds of length limitations common to LANs and thus it can, in effect, either convert a LAN to a WAN or provide wide area access to and from LANs and campus networks.

A Role for ISDN in Higher Education?

The future role of ISDN in higher education will depend on product availability and cost as well as upon the institution's vision of the role of telecommunications in its future. If a college or university sees telecommunications as central to its mission and plans to eventually extend voice and data communications to every office and dormitory room on campus, ISDN can play a role.

ISDN may offer some important advantages to institutions with one or more of the following characteristics:

1 a need to extend data communications to remote locations on campus
2. a need to extend data communications to dormitories and/or faculty homes
3. significant off-campus course offerings
4. multiple campuses
5. no campus at all
6. consortial relations with various off campus entities
7. large numbers of commuting students

The Speed of ISDN

A major issue in determining the role of ISDN is its data transmission capacity. Under present standards, ISDN will provide a data communication rate of 64 KBPS. A higher speed of 1.54 MBPS will also be available at a higher cost. Broadband ISDN is still in the standards development phase. When standards are completed and products emerge later in this decade, the data rates are expected to be between 50 and 500 MBPS.

While a 64 KBPS data rate will not satisfy users who have come to expect Ethernet speeds, it will be a major improvement to those who now are limited to speeds of 1200 or 2400 bps. Moreover, ISDN can provide access to the campus network to users from remote corners of campus and from off campus who may now have slow and unreliable dial-up access.

Conclusion

ISDN is not a telecommunications panacea. It will not replace all existing networks nor is it likely to satisfy all the networking requirements at a college or university. Nevertheless, ISDN may be the best way to provide telecommunications access for some users. In addition, because of its flexibility, it can provide emergency or backup data communications when dedicated services fail. For these reasons, and others, it is time to take a fresh look at ISDN.

Constituent Group Meetings

Twelve subgroups of CAUSE members and conferees met at CAUSE90 to focus on issues unique to their shared work environments. These Constituent Groups are organized to encourage communication among professionals who share specific problems and functions. The groups meet during the National Conference, and occasionally at other times during the year. The number and focus of the groups change according to members' needs.

Administrative Systems Management
Coordinator: A. Wayne Donald, Virginia Tech

Chief Information Officers
Coordinator: Kenneth G. Pollock, Wright State University

Community and Two-Year Colleges
Coordinator: Al LeDuc, Miami-Dade Community College

Data Administration
Coordinator: Richard D. Sheeder, Penn State University

Executive Information Systems in Higher Education
Coordinator: Dennis W. Viehland, University of Arizona

Four-Year Colleges and Universities
Coordinator: John W. Eoff, New Mexico State University

IBM Higher Education Software Consortium
Coordinator: Douglas E. Hurley, University of Kentucky

Institutional Researchers and Planners
Coordinator: Richard Howard, North Carolina State University

Medical/Health Science Schools
Coordinator: Carla T. Garnham, Medical College of Wisconsin

Multicampus/State Systems
Coordinator: Robert R. Blackmun, University of North Carolina

Small Institutions
Coordinator: Louise S. Lee, Barry University

User Services
Coordinator: Penny Peticolas, Oakland Community College

Administrative Systems Management

Convenor: A. Wayne Donald, Virginia Tech

The Administrative Systems Management Constituent Group held its initial meeting at CAUSE90, with over 60 attendees present. Wayne Donald, Manager of Administrative Systems Planning at Virginia Tech, convenor for this constituent group, opened the meeting with background information about the purpose of a constituent group and why this new group is important to CAUSE and its members. Because of the group size and limited time, introductions were skipped.

Pre-conference information had indicated a high level of interest in this new constituent group. Rather than opening the floor up for general discussion, the convenor presented an agenda that was based on information gathered electronically (via BITNET) prior to the meeting. Approximately 30 individuals had been polled and asked to specify their major concerns dealing with administrative systems management. Responses were consolidated into 22 topics, but only the top two (based on number of responses) were on the agenda for discussion.

The first topic, or area of concern, was "a lack of recognition regarding the significant role played by administrative systems." There was no lack of comments from the group, and it was a general consensus that administrative computing will always take a back seat to academic and research needs. However, through education and open communications, there are opportunities to keep people better informed of administrative systems and their importance to the institution. A good point was made that it is a two-way street—that is, as computer specialists we have to make an effort to better understand the business processes of the institution. Some final comments were made about staying motivated by setting goals, having positive attitudes, and continuing to try to dissolve any boundaries. The recognition for administrative systems is difficult and it is something those involved with administrative systems must constantly strive to achieve. There are simply no answers.

The second area of concern, "planning for the distributed environment," did not get as much time for discussion, but there were some very good comments. Several individuals spoke about the confusion of distributed concepts—distributed authority; distributed computing; distributed applications; and so on. Another topic of discussion was the real costs associated with distributed technology. Who is going to pay for what and how is it all coordinated? This is a technology that many are facing, and it will be important to develop plans that will assure a wise investment for the institutions. It was suggested a forum might be appropriate to further discuss the planning issue and various distributed concepts.

Although there were no revealing solutions for these concerns, the group did enjoy the exchange of information and recognition that all have some common problems. The convenor briefly recognized some of the other topics; security; systems integration; personnel issues; priorities; CASE/re-engineering; and research and development efforts.

As for future plans, there was complete agreement that the group should continue to meet at the CAUSE conference. It was suggested that a list server be set up for the group and that the server be promoted in CAUSE publications. There was also some discussion about articles for CAUSE publications, use of the CAUSE Library and new member profile, surveys, special interest projects (such as UNIX), and meeting at CAUSE91. As more information develops about these potential efforts, CAUSE members will be informed through appropriate channels.

Chief Information Officers

Convenor: Kenneth G. Pollock, Wright State University

Approximately 60 people met at CAUSE90 in Miami to discuss issues related to the role of Chief Information Officers (CIOs) in higher education. This constituent group began in September 1986 and has been meeting twice a year since—at the annual CAUSE conference and at the end of April in Chicago for a one and one-half day session.

The group was originally formed by Joe Catrambone, who organized and led the biannual meetings. Joe's unfortunate death requires past and potential participants to decide if, how, and when this constituent group should continue. A survey was conducted during the meeting and 88 percent of the participants were interested in continuing the group.

The survey also showed that only 37 percent of the institutions represented had a budget increase this year and 35 percent expect an increase next year. Approximately 30 percent expect a budget decrease next year.

The meeting began with Jim Penrod (Cal State/LA) providing a summary of, and leading a discussion on the findings contained in CAUSE Professional Paper #4, *The Chief Information Officer in Higher Education.* During the balance of the meeting, the participants were subdivided into three discussion groups charged with developing a list of issues facing CIOs in the 90s. This list (available from Ken Pollock at Wright State University or the CAUSE office) will be used to develop agendas for future CIO constituent group meetings.

Community and Two-year Colleges

Convenor: Al LeDuc, Miami-Dade Community College

A new format was attempted this year, with two planned presentations, both of very short duration. First, Bruce Rose from Cuyahoga Community College, gave a presentation on the implementation of a wide area network at his institution. Al McCord from Oakland Community College then described the successful installation of American Management System's software at his institution. The intent with these presentations was to give a brief overview of experiences so that participants at the session could listen to examples of challenges met with expertise utilized.

Mike Zastrocky, Vice President of Information Resources for CAUSE, then discussed the efforts that CAUSE is making to better meet the needs of two-year colleges.

There was time for a short discussion of issues that community colleges are concerned with. How can these issues be dealt with on a better basis than attempting to entrap the experts at the CAUSE conference? A central point seemed to be that on a day-to-day basis there is a need for some means of communication among counterparts. Existing BITNET bulletin boards seem not to be a full answer, nor is there any practical way at present to manage a CAUSE bulletin board. Additionally, many institutions do not have ready or cheap access to any network.

A major conclusion was that the Constituent Group needed more than one hour to meet. While this year's format was very useful, there was inadequate time to go around the room and have all the participants explain the technical or political situations at their institutions. This has been a helpful technique in past years to enable people to find and follow up with people in similar situations.

Data Administration

Convenor: Richard D. Sheeder, Penn State University

Approximately 40 people attended the Data Administration Constituent Group at CAUSE90. Items presented and discussed were:

1. Meeting of the Special Interest Group on Data Administration at the Association of Institutional Research Forum in Louisville, May 1990.

Richard Sheeder chaired the meeting at AIR and reported that seventeen people attended the session and discussed, among other topics, where data administration should be organizationally located within the institution. There was concern that if it were located in the MIS organization there might be insufficient understanding of the data needs of researchers or analysts in the academic or other administrative offices of the institution to support them to the extent needed. The group acknowledged the need for interaction among the data administrator, system users, data stewards, and development personnel both during system development and in the evolutionary phases following completion of a basic system. All agreed that the data administrator needed to be both a technologist and a "people person."

2. The Data Administration Management Association.

Leonard Brush, Director of Administrative Systems at Carnegie Mellon University, discussed the activities of the Data Administration Management Association. He reported that he is serving on a subcommittee of DAMA developing standards for data administration and offered to send a copy of the draft being published in early 1991 to any constituent group member interested in reviewing it.

3. DASIG, the electronic mail distribution list for data administration.

The use of the electronic mail distribution list, DASIG, was discussed. There are currently over 200 members on the list representing over 100 higher education institutions in 44 states and five other countries. Attendees were encouraged to join the list if they had not already done so, and were further encouraged to actively use the list which is maintained on a LISTSERV at Syracuse University. The address of the list is DASIG@SUVM.BITNET and it is "owned" by Sue Borel at Syracuse, who can be reached at SBBOREL@SUVM.BITNET.

4. Preservation and Utility of Archival Tapes.

Richard Sheeder discussed a sponsored research contract funded by the National Historical Publications and Records Commission of the National Archives which is currently under way at Penn State. Old archival tapes are being evaluated for readability and utility, and recommendations will be forthcoming which specify how archival data should be stored and periodically recopied, and what documentation and software support should accompany archivally stored data sets. Richard reported that the University Archivist had attended a recent national meeting on archiving, and indicated that discussions of the use of archival electronic records for research filled large portions of the agenda, significantly more than ever before. Data administrators need to be aware of this growing interest.

5. The Data Administration Advisory Committee at Penn State

At the 1989 CAUSE conference Richard Sheeder reported on the formation of a small data administration advisory committee to provide ideas and feedback to the Manager for Data Administration at Penn State. The committee has been in place for nearly a year and has assisted with ideas about more user-friendly on-line presentations of the Data Dictionary, as well as other ideas about smoothing the flow of

requests for data. The committee is very much a success, and formation of similar advisory committees at other institutions with data administrators is recommended.

Executive Information Systems in Higher Education

Convenor: Dennis W. Viehland, University of Arizona

Development of executive information systems in higher education institutions continues to be a topic of hot interest, as indicated by the attendance and discussion at the CAUSE90 EIS Constituent Group meeting. It was almost standing room only as approximately 80 conferees attended the meeting.

The principal focus of the meeting was a discussion of barriers to EIS development. Among the barriers listed by group members are:

- inadequately developed database systems to support EIS;
- money (turn-key systems are very expensive and internal development can be even more expensive);
- computer services, acting in an EIS developer role, does not know what the executive wants;
- executives do not know what computer services can provide (what data are available);
- institutional credibility (what are proposed uses, at what level);
- buck passing to the institutional research office;
- inadequate user interface (not executive friendly enough yet);
- interpretation of data (executives do not always know how to interpret the data and information they get from an EIS;
- private ownership of data (data owners are unwilling to participate);
- inadequate time frame for decision-making (can EIS provide the requested data in a prompt manner, prompt enough to be useful in making a decision);
- establishing priorities for EIS development.

Continuing an EIS group tradition, there were numerous on-the-spot surveys done by members raising hands in response to questions. For example, it appears the dominant use of computers by higher education executives is electronic mail and word processing; spreadsheet use is considerably less, and the group reported almost no database use by executives. In response to another survey question, 15 members of the group reported they have direct job responsibilities to provide executives with information, but more often than not this does not include an EIS—at least not yet.

Robert Glover from the University of Hartford reviewed the on-going EIS development at UH. Robert and his colleagues are sharing what they have done, including Lotus templates, through numerous seminars such as one that was a pre-conference offering at CAUSE90.

Chuck Stomper from the University of Missouri announced that UM and IBM are launching a joint project for EIS development using UM data systems and IBM EIS products.

A group member suggested that at his institution they found one of the most useful EIS tools was simply putting board of trustees minutes on-line for executive searching. The use of electronic factbooks and hypertext (e.g., for administrative calendars, staff lists) were suggested as other avenues for EIS development.

CAUSE conferees who are not members of the EISSIG list were encouraged to subscribe to the list by indicating so on the attendance sheet or contacting the list owner directly (Dennis Viehland: DVIEHLAND@ARIZONA.EDU)

Four-year Colleges and Universities

Convenor: John W. Eoff, New Mexico State University

Approximately 35 conferees participated in the Four-year Colleges and Universities Constituent Group meeting. Following a brief review of the constituent group purpose, the conferees divided into three groups to discuss experiences in either financial record systems, payroll/personnel systems, or student information systems. Originally it was intended to reform the groups into one group and have an individual report the highlights of the particular group. As it turned out, it appeared to the convenor that the groups were enjoying their discussions so well, it was decided to continue to the end of the sessions in individual groups.

A list of conferees will be distributed to all in January, 1991 for contact purposes. Secondly, conferees will be asked to comment on the format of the group meeting to see what suggestion may be made to improve next year's meeting.

IBM Higher Education Software Consortium

Convenor: Douglas E. Hurley, University of Kentucky

For the past several years, there has been a Higher Education Software Consortium (HESC) Constituent Group at the annual CAUSE conference. This year's meeting was the most successful and well attended; there were approximately 35 institutional conferees in attendance along with approximately 5 IBM representatives.

The session focused on the fall 1990 HESC announcements from IBM. These announcements were very significant: new software groupings were announced and the pricing structure was modified. Highlights of the new HESC offerings were discussed; various attendees raised questions about why some products were removed, and why others were not added. Major changes included: VSE group price increased; new groups were established for VM printing and publishing; VM communication products; VM productivity tools; RISC 6000 Engineering and CIM products. In addition, VM/ESA and VSE/ESA were announced under the HESC.

The role and mission of the HESC Executive Committee was discussed, as well as how more people can become involved with the HESC. The mission of the HESC Executive Committee is to:

1. Represent the HESC member schools to the IBM-ACIS organization.
2. Lobby IBM-ACIS for additional and improved HESC software offerings.
3. Conduct a yearly poll of HESC members to determine HESC software and service requests.
4. Provide a means for HESC members to communicate about HESC issues.
5. Encourage the development of educational materials and workshops dealing with HESC software.
6. Provide a vehicle for the coordination of the various HESC special interest groups.

The meeting concluded with an extended question and answer session with Arnie Ockene and Fred Dwyer.

This Constituent Group continues to be a useful means to inform institutions of the HESC offerings, and to allow a forum for CAUSE conferees who are also HESC members to voice concerns and needs directly with IBM-ACIS personnel.

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Institutional Researchers and Planners

Convenor: Richard Howard, North Carolina State University

Approximately 50 CAUSE90 attendees met for the Institutional Research Constituent Group. They discussed the issue of data quality in support of decision making. Perspectives of both private and public institutions were represented. It became obvious as the discussion went on that this is a concern of most institutional research offices and is requiring greater attention as institutional data is being distributed and analyzed by decentralized units. Techniques and "tricks" used at several of the institutions represented were shared.

Medical/Health Science Schools

Convenor: Carla T. Garnham

Fifteen conferees from eleven states attended the Medical/Health Science Schools Constituent Group meeting. The most arresting topic was the National Library of Medicine (NLM) plans to offer MEDLINE over Internet. Most of the participants did not know about NLM's plan, welcomed it enthusiastically, and wanted more information as quickly as possible.

That lively discussion led naturally into Sandy Colombo's announcement that she has established an electronic list mail service group for the CAUSE Medical/Health Science Constituent Group at the University of Michigan. To join send an Internet message to MHSCG@UM.CC.UMICH.EDU or a Bitnet message to MHSCG@UMICHUM. Please include your name, institution, address, and telephone number.

Some participants were new to medical computing, and the group spent some time orienting them into the complexities they could expect. Remaining discussion focused on other topics of interest to everyone: networking, strategic planning, site licensing for CD-ROM products, and relationships with hospitals.

The principal theme was the substantial need of information systems managers in medicine for more communication among themselves and with representatives of government agencies, such as NLM. The new electronic list mail service will be most useful.

Multicampus/State Systems

Convenor: Robert R. Blackmun, University of North Carolina

The Multicampus/State Systems Constituent Group meeting at CAUSE90 was attended by 25 representatives of colleges and universities in 13 states along with 4 vendor representatives.

Topics discussed by the group included:

- Need for and efforts to develop system-wide standards for applications software, data elements and report formats;
- Efforts to use state-wide networks for administrative reporting;
- Organization and operation of state-wide networks and information systems organizations

A discussion of the formation and operation of state-wide and regional organizations with similar purposes and formats to CAUSE was led by CAUSE Board member A. Jerome York (University of Cincinnati). Representatives of states having such organizations, including Ohio and North Carolina, and

those having an interest in state-wide or regional groups, including Virginia, Oregon, and Alaska, discussed the opportunities and difficulties in such activities. The points raised in this discussion will be reported to the CAUSE Board for further consideration of CAUSE activities in this area.

Small Institutions

Convenor: Louise S. Lee, Barry University

Because computer professionals at small institutions must have a broad knowledge of the field, resource and knowledge sharing is a primary survival mechanism. Discussion focused on how to get the most out of CAUSE membership in general and the national conference in particular.

There was general agreement that the conference program could offer more to members from small institutions. The group would like to see more track presenters from small institutions and some representation on the program committee. Members from small institutions have much expertise to offer in certain areas such as integrated systems.

Discussion followed on particular issues. Most of the issues that are relevant to small institutions are not unique. Perhaps the differences are more a question of magnitude and the degree of creativity that must be exercised. Topics included setting up networks, selecting and implementing software, educating your boss, remote computing, creative funding, and staffing.

There were two separate ad hoc meetings. Richard Kimball did his standby presentation "Bootstrapping a Small Campus into the Electronic Age." The second was a discussion that centered largely on networks and shared software development.

User Services

Convenor: Penny Peticolas, Oakland Community College

The User Services Constituent Group Meeting was a very productive exchange of problems, ideas, and suggestions among 15 to 20 participants who came and went during the two hour time period. We began the meeting by collecting the topics that each person wanted to discuss and then prioritizing them. The topics we discussed this year were software site licensing, training, management of classroom labs, distributed services, software inventory, standards, cost recovery, and merging academic and administrative support. Many people had suggestions for their colleagues in similar situations and most who attended found the time very well spent.

"Writing for *CAUSE/EFFECT*"

This two-hour seminar, hosted by the CAUSE Editorial Committee for all interested CAUSE90 conferees, offered guidelines on writing for professional publication with tips for appropriate articles for *CAUSE/EFFECT* magazine. More than 50 participants attended this session, which has been very favorably reviewed in the three years it has been offered.

The featured speaker for the seminar was Kamala Anandam, associate dean of educational technologies at Miami-Dade Community College and an IBM/ACIS Consulting Scholar, who has written eight books and two dozen articles on uses of technology for education.

Julia Rudy, CAUSE's director of publications and editor, summarized recent changes in the profession which *CAUSE/EFFECT* is responding to, and described the kinds of articles she and the Editorial Committee look for.

1990 Editorial Committee Chair Mark Perkins led a panel of his committee members—Karen Miselis, Nate Felder, Bill Moressi, and 1991 Committee Chair Jan Baltzer—in a discussion of their experiences reviewing submissions for the magazine.

Among the session handouts was a call for articles describing the issues and topics which will be of high priority in the magazine this year.

Kamala Anandam

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CAUSE90
MIAMI BEACH
NOVEMBER 27-30, 1990

TRACK I

PLANNING AND STRATEGY

Coordinator: Ronald L. Moore, University of Louisville

Institutions of higher education depend on an information infrastructure for their growth and prosperity. The acquisition, development, and implementation of technology must be directed by and encompass the overall mission and strategic emphasis of the institution. Papers in this track discuss approaches to information technology strategies which are commensurate with an institution's mission and strategic directions.

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CAUSE '90

Future Directions In Higher Education: A CIO's Perspective

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ABSTRACT

The future directions for an Information Systems department in higher education has little foundation in the past. As Paul Valery noted, "The Future... Isn't What It Used To Be." External sources such as "Megatrends," Fortune magazine, Index Group and MIS Quarterly have discussed the key issues of the 90s. However, how these results can be related to higher education and its uniqueness is never discussed. This paper will begin with the issues as stated in the corporate environment, look at the issues affecting higher education and relate both to the role information systems and information technology can and should play for future growth. The I/T executive in the academic world must remember who his customers are, who pays his/her salary and to whom he/she must be accountable. The key management issues of role change, organization, fiduciary responsibility and image for the department and the leaders of I/T on the campus will be addressed from the CIO's perspective.

"In Times Of Turbulence The Ability To Anticipate Enhances Dramatically Your Chances For Success." *Peter Drucker*

INTRODUCTION

The Information Systems department in higher education is looking towards an exciting future--a collision with tomorrow. Tomorrow is not going to look very much like yesterday; it is not going to look very much like today for the higher education institution or for the Information Systems department within the higher education institution. The purpose of this paper is to challenge the reader to recognize and question changes which will assist a person in the Information Systems department to anticipate the future.

FUTURE TRENDS

The trends occurring around us in the universe all affect how we should be looking at the Information Systems department's role in a university or in a business during the decade of the 90's. We must look at global trends, megatrends, market place trends, management trends and work place trends. We must examine the issues of concern to various C.E.O's and other leaders of the society. This will allow us to look at the higher education issues of the 90's from more than a parochial point of view. A C.I.O's perspective of future directions in higher education has to address the external aspects, the internal aspects, including his organization, and most of all the changes that are occurring. Coping with change is the most challenging of the 90's issues. Our goal should be to affect the future, not merely accept the future.

A. Global Trends

We are entering a time when the "global village" is going to be realized. We have a series of recovered dominant economies, especially Japan and Germany, the unified Germany; we have new industrialized countries, Korea, Taiwan, Singapore; we have a shift in the economic environment in Eastern Europe, Russia and maybe China; and, certainly, we have a whole new power structure with the European community of 1992 and the Pacific Rim Countries. There is an aging work force. There will be the economic triad of Europe, the Pacific Rim and the Americas, North and South; there will be strategic alliances that will come up necessitating newly formed relationships; there is a shortage of critical skills; there will be a looking at the environmental impacts of decisions; views will change from gross profit to market share analysis; a global competition will be an aspect to be examined seriously by all organizations, whether in higher education or in the corporate world. Except for the middle east crisis, generally there will be a war to peace paradigm and throughout the world it looks like there will be a shift in values. Examples of the above are in the

newspaper on an everyday basis. Most universities are looking, for example, towards international education for their students. The University of Miami has arrangements with forty three (43) institutions in seventeen (17) countries all the way from Argentina to Vietnam.

In their book "Megatrends", Naisbitt and Aurenberg list the ten (10) megatrends of the year 2000. They, too, list the Pacific Rim as where the future lies; that there is going to be a move toward world wide free trade, that an information-based economy is a high wage economy. Included in their listing are some important and interesting items such as English emerging as the first universal language. They expect a period of economic good times and expansion; there is a dual direction of globalization and nationalization; cities will decline and the quality of life rural areas will emerge significant. Although the information based economy is important in the future and the directions of change will be driven by it, the big story will not be in technology, but with the renaissance in arts, literature and spirituality. This has an affect in higher education because the students will be a different kind of student, more like the 60's rather than the 80's. Alvin Toffler, in his most recent book "Power Shift," says "The most important power shift of all is not from one person, party, institution, or nation to another. It is the hidden shift in the relationships between violence, wealth and knowledge as society speeds toward their collision with tomorrow. The growth of knowledge as a power is a force to be reckoned with in the 90's."

B. Marketplace Trends

In the marketplace, whether in higher education or in industry, there will be a customer obsession. We will look towards electronic data interchange as a productivity tool. The demassification predicted in the early 80's book by Toffler, "The Third Wave," will become more real with the variety of products customized to meet the consumer demands. More efforts will be expended to compete in time, with time being utilized as a significant variable. Lastly, more electronic marketing will be accomplished whether through systems such as "Prodigy" or the home shopping network, or microcomputers in the household through modems connected to consumer networks. All of these will result in changes in the information society that will have to be addressed by the C.I.O. In higher education the customer obsession, the student obsession, the faculty member obsession and the administrator obsession will make customer satisfaction programs and total quality improvement programs commonplace rather than the exception.

C. Management Trends

The 90's will also see a change in the way we manage people. We will go from the czarist or "General" approach to the coach approach. Organizations which were previously strictly

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hierarchical will become more network oriented and the demassification will be utilized as a methodology for organizational structure as well. Power to the people, with the people at the lower echelon being able to act as decision makers will be tested and proven to be moderately successful. Another trend would be towards aligning information technology with the goals of the organization, utilizing such things as decision support systems and executive information systems at the levels of management that they are appropriate. Expectations for every president of every university or corporation to be equipped and desirous enough to hit a terminal or a computer on a regular basis to seek his information rather than call a staff member, will still remain ill founded. The role of the Senior Information Technology Executive, whether called a C.I.O. or something else, will change to become more important in the organization in regard to planning and the setting of directions. The role of the C.I.O. will have staff as well as line functions, with the distribution of those functions dependant upon the organization and the method of leadership of the senior executives.

D. Work Place Trends

As noted previously, in the work place we will have empowered people with participatory management at all levels of the organization. More and more the front end person, the person of first contact, will have greater information and ability to solve problems. There will be work teams developing what we will call groupware, meeting the needs of a variety of subsets across organizational lines. There will be greater efforts to have people work at home on a full time and part time basis so that they can dial up through some technology to access the databases needed for them to perform their functions. Because of health care costs rising at such a rapid rate, there will be a greater tendency towards part time employees or outsourcing of functions in order to overcome the overhead costs of providing health care insurance. There will be a growth in work station power along with ease of use of software, so the knowledge worker can perform more on a simplistic basis. The ease of the use of the work stations and the ease of utilizing databases are extremely important because to find the trained workers needed in the year 2000's workplace will be difficult. In addition to the above trends, there will be a review of the loyalty of firms to employees and employees to firms and the anxieties caused by this lack of loyalty of the 80's. The reduction of middle management and seemingly removal of layers of organization without preparation, has caused both the loyalty level to go down and the anxiety level to go up with people anticipating work in the same organization from their inception into the work force to their retirement. No longer will this be a common practice in the workplace. Lastly, for productivity reasons, along with logical reasons, less automation of current entities will take place, but more re-engineering of the work will take place. As Mike Hammer has been quoted with regard to re-engineering work, "It

is time to stop paving the cow paths. Instead of embedding outdated processes in silicone and software, we should obliterate them, and start over." We must change the way we do business.

FURTHER ISSUES OF CONCERN

A. Issues Of Concern To C.E.O's

A 1990 survey of C.E.O's in Fortune Magazine listed their major concerns to be cost containment, productivity, training and motivating employees, new product development, government regulations, and global competition. The significance of the survey is that the first three items are far and away the most important to C.E.O's. Index Group, Inc. had a comparison of the key issues in 1990 as compared to 1989 for 243 U. S. and Canadian executives. The listing is shown in table 1 below. The significance there is that the #11 item in 1989, "Reshaping business processes through information technology" has become the #1 item, while the #1 item of 1989, "Using information systems for competitive breakthroughs" has now dropped to the #8 position. Both surveys, you will notice, are looking for the reshaping of business processes. They place great emphasis on cost containment, productivity, and training and motivating employees, in order to create an organization poised and ready with the least fat for the year 2000. These executives looked at education and the alignment of information technology goals as important functions as well and certainly realize implementation of information technology is an important consideration for the year 2000 for the goals to be achieved.

B. Higher Education Issues Of The 90's

The Winter, 1990, "Educational Record," contained a listing from University/College Presidents' perspective of the most significant future issues confronting higher education. The analysis was divided into all institutions, public institutions, and private institutions. Far and away the number one issue was maintaining a proper level of funding. The interesting part occurs when you examine how the distribution occurred with regard to the other items of concern mentioned. That can be found in table 2 below and depending on what kind of institution you are associated with, this should be indicative as to the important issues as viewed by your President and his counterparts. In comparison with the previous _Fortune_ Magazine study, managing the costs of higher education which one would consider to be similar to cost containment, is low at public institutions, but yet high with C.E.O's and medium to high with private institutions. Higher education seems to be lagging once again with regard to the important issues of the next decade. A paper could probably be written on the differences between the responses of the presidents and the responses of the C.E.O's in terms of how they view what the future will hold.

TABLE 1

1990 KEY ISSUES....INDEX GROUP INC. RANKINGS

1990		1989
1	Reshaping business processes through information technology	11
2	Educating senior management on information systems	3
3	Instituting cross-functional IS	7
4	Aligning IS and corporate goals	2
5	IS strategic planning	4
6	Boosting software development productivity	13
7	Utilizing data	6
8	Using IS for competitive breakthroughs	1
9	Developing an information architecture	5
10	Cutting IS costs	14

243 U. S. Canadian Executives

TABLE 2

The Most Significant Future Issues Confronting Higher Education

	Percentages of Respondents Who Ranked Item as Extremely or Very Important		
Item	**All Institutions**	**All Public Institutions**	**All Private Institutions**
Maintaining a proper level of funding.	93%	95%	91%
Maintaining a proper level of financial aid.	87%	79%	92%
Attracting and retaining qualified faculty members.	84%	88%	81%
Recruiting racial and ethnic minority students.	80%	84%	77%
Recruiting and retaining racial and ethnic minority faculty.	79%	88%	73%
Ensuring the quality of academic programs.	78%	73%	82%
Managing the costs of higher education.	77%	70%	83%
Assuring access of students from diverse socioeconomic statuses.	77%	79%	76%

(Percentages rounded to the nearest whole number)

Educational Record *Winter 1990*

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Beyond what the presidents say as their issues facing higher education, other issues exist. Tuition, and its absolute and percentage increases that have been occurring, the quality of the undergraduate experience, the costs of the academic program delivery, the achievement of revenues and the costs of administrative and academic services are all of concern to politicians, academicians and parents. As everyone is aware who reads any newspapers, tuition has been increasing in the past decade on an absolute and percentage basis far beyond what would be expected by the consumer price index. This cannot continue at that level and places such as Stanford University, the University of Miami and other institutions are already announcing cutbacks of their tuition rates. However, the absolute tuition continues to go up both at private and public institutions.

With regard to the quality of the undergraduate experience, it is intriguing that although we measure entrance quality of the students using SAT scores, there is no measurement as to the value of education received by the student with an exiting test. The quality of the undergraduate experience is subjective and measured by the undergraduate institution, rather than by an objective outside measure. If we think it is important enough to have an objective outside measure of the quality of the students as an input, it seems strange there is no objective measure of the quality on the output side. If the student comes into an institution with a 1500 SAT and he graduates with a 1500 SAT, what value was added by the institution? Would it not be more impressive if a student came in with a 1000 SAT and graduated with a 1500 SAT? Our measurements of the quality and the value of the higher education experience need to be reanalyzed.

With cost containment being a big and hot issue in the corporate environment, obviously the academic environment is going to follow suit. The cost of academic program delivery by delivering a product the same way as it has been done over the last 300 years, and the cost of all the services provided along with the manner in which they are provided, have to be reviewed. Those institutions doing these services better at less of a cost or more productively, are the universities that are going to succeed in the year 2000. Cost containment becomes a primary concern when the revenues to the institutions are decreasing on a percentage basis. Government allocations for research and student aid are not growing in the same proportion as the costs. Tuition, as mentioned above, cannot grow at the same rate as it has been. Thus the combination of seeking new areas of revenue and reducing costs are prevalent issues for higher education in the 1990's. We cannot continue to do business the same way we have been doing business for the past three hundred (300) years. The university solving the problem of delivering its services at a lower cost per student will survive the 90's. The institution which finds a way to increase its productivity and still maintain the quality of its educational program will be the leader of the 21st century.

For each institution, an interested insider will view its problems in a more parochial vein. The role of teaching vs. research depends on the institution and its mission. The fight between Political Correctness and the National Association of Scholars can become an overriding issue and be divisive on the campus. The distribution of the decreased budgets, while meeting increased demands, requires leaders of solomonistic proportion. Reallocation of resources with a view toward the year 2000 has to be accomplished on a step by step basis. In addition, more interdisciplinary courses have to be offered to students who, as was mentioned before, are now more like the students of the 60's than the 80's, interested in environmental and social issues more than specific sectionalized issues. Thus, in conclusion, the 90's hot buttons to be encountered successfully in order for us to survive as institutions in the year 2000 are (1) the demand for more with less, (2) the obsession with the customer, (3) the implementation of the avalanche of technology, (4) the competition in time, and (5) the diversity of cultures and how they can be integrated through an interdependent independence.

MANAGING INFORMATION TECHNOLOGY IN THE 90'S

The most exciting issue of the 90's for executives is the management of change. Information technology's role in the management of change will determine the success and failure of a particular organization. Change can occur either by erosion or explosion. There are advantages to each. In terms of erosion, since waking up an organization leads everyone in the organization to hate or resist you, making gradual and small increments of change can prove successful. Little bits and little bites are very rarely noticed and change can take place because pretty soon a few bites add up to an entire meal. In addition, doing it on a slow and steady pace will allow the political environment to adapt to the change. One of the most common errors occurring in introducing change is to underestimate the political environment and not allow the informal organization to accept the alterations before the formal organization accepts it. There are advantages to the explosion methodology as well. If, in fact, the organization notices the bits and the bites, incremental change can build resistance. Thus, instead of working in favor of what you are trying to accomplish, it can actually work against you. For example, depending on the environment and depending on the availability of resources, the slow and steady introduction of electronic mail with those that are already on the network, can often lead to the acceptance of electronic mail. In some institutions without forcing everybody on electronic mail all at once and making it the only methodology for internal communication, electronic mail would never be accomplished. Thus, both methods can work but they are strictly dependent on the institution and its political environment.

The role of information technology is changing within organizations. The particular business functional unit is gaining increased responsibility for information technology, in order for it to produce what it feels necessary to do its job in a more timely manner. The scope of information technology is being extended beyond the enterprise using electronic data interchange and no longer is viewed as an island within the current organization. In addition, its role is changing because people see information technology as a support mechanism for gaining comparative advantage. Utilizing computer systems and software so databases can be accessed and kept up to date are necessary to maintain competitiveness. The accuracy of the data and the administration of the databases is of vital concern.

Human resource availability is another concern. Quality and quantity are questionable. The U.S. population growth is flat and any growth of workforce will come from immigration. In terms of the student body, the major growth will occur in the minorities. The number of 22 to 25 year olds as well as the U.S. median age is showing a down trend. More people left the labor force than entered it, withi the past 5 years. Two to three percent fewer students graduated from college in 1990 than in 1985, leaving less people available to employ. There will be less quality brought forth from the educational marketplace. One out of five people entering the labor force from 1975 to 1985 did not have a high school education. In the last three years it has risen to one in every four. Corporations are viewing the lack of quality with alarm and spending their own money to educate in basic remedial courses, in addition to training. Estimates of $20 to $50 billion a year are being spent by U.S. businesses in remedial education. If you think about it, $50 billion was the net profit for the top 28 Fortune 500 companies in 1987.

We are looking at the 3 R's of staffing for the 1990's. The importance of recruiting, retraining and retaining cannot be underestimated. Recruiting has to become more competitive and the skills necessary for each job are constantly changing. Once you recruited the staff, you have to keep retraining them because changes are occurring on a daily basis and even techies need to learn how to become, to some degree, managers, and managers have to become techies to some degree. The cost of hiring somebody new very often is overlooked by not trying to save somebody who may be performing adequately. We have a tendency to seek perfection rather than to seek competence and the cost of retaining and retraining is far less than the cost of recruiting somebody for a particular position. The use of rewards such as financial fringe benefits, family benefits, and general pleasantness of the work place have a productivity value.

As noted before, along with the flattening of the organization or the demassification of the organization, there is a change with regard to the restructuring of the information technology

organization The information technology executive has to become more of a member of the policy team and involved in the planning for the 21st century. With increased focus on policy goes increased focus on strategy, planning and marketing as well as involving the functional managers in information technology decisions. The Senior Information Technology Executive must have greater vision insights, realizing services must be delivered any time, any place and to anyone in a mass customizing manner. The executive must shift her/his power base from owning to influencing with her/his ownership only of the critical shared resources. In conjunction with others, the C.I.O. can set policy and strategies, but the functional manager will have increased responsibilities. The Senior Information Technology Executive or C.I.O. must be market and customer driven, must change from building a technology (hardware/software) base to implementing with the current technology. Vision setting, management of change, making application of technology transparent and reducing the work force of the I.T. organization and the overall organization have to become goals. The C.I.O's reason for being is to provide vision and to reduce the time and numbers of decisions in process. One of the greatest losses in productivity, especially in higher education, is having many decisions in process rather than completed.

Realizing cost is a significant factor, especially cost of technology, there must be a financial strategy examining tangible and intangible benefits and looking at technology as an asset to the business rather than an expense. To do this, the financial strategy should be designed to modify behavior with its pricing critical to marketing. There should be a cost and price differential in order to create a reserve for information technology capitalization in the future. A strategy must be developed in concert with the functional managers. The managers must be empowered to do their job in a better way and this will allow them to make the business case for the growth in information technology. The greatest asset the Senior Information Technology Executive has when asking for increased resources is having the functional managers present the case.

The image of the Senior Information Technology Executive has to change. He/she has to go from the past czarism to become an influencer. He/she has to show results, not just activities. He/she has to be customer driven, rather than user driven. He/she has to have passion and understanding rather than merely intellect and technology. He/she must be more humble instead of arrogant, innovative rather than incremental and must look at things in terms of implementing rather than just planning. He/she must empower rather than control the customers.

There is an accountability function everyone in higher education has to address with regard to their particular functional role. Why your job exists and what you are paid to accomplish are things

that should be paramount in your mind at all times. To be accountable you have to challenge the status quo, do at least as much with less, achieve your successes through others, make sure the information technologies align with the educational goals of the institution and every so often, once a week or once a month, you must take a position-even if it means gambling your job. We must remember, we are in the education business, the service business and the information business. What we have to do is to look back to see the future. Do you remember when the customer was always right, you realized that if you didn't try you lost, well begun was half done, honesty was the best policy, you treated others as you wished them to treat you, you could catch more flies with sugar than with salt and if you couldn't say anything nice about a person, you didn't say anything at all? We, in the education business, sometimes act like we are the least educated. Our reason for being is to add value to the university. Value is obtained by improving the academic, research and administrative performance of others. How much of what we do that is utilized in improving the quality of students, instruction and research is our value measurement.

To survive the 90's we have to change and along with this changing we have to reengineer our business. A new combative and visionary form of management aimed at improved productivity, quality, flexibility and customer focus is now the only way for a university to survive the 90's. We must change the way we do business.

Strategic Planning in a Non-Strategic Environment

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ABSTRACT

The accepted wisdom concerning planning for information systems is that such plans need to be tied to the institution's strategic goals. This assumes that the institution has strategic goals. Suppose the institution is in a state of transition, unsure of its mission, and/or not yet thinking strategically? Is it possible for the information services department to plan strategically in such an environment?

This paper is a case study of the efforts of an IS committee to develop a strategic plan in an institution that was in conflict over its mission and lacked explicit strategic goals. The IS committee first concentrated on uncovering the institution's core values and widely-held beliefs. It used these to make assumptions about the strategic directions the institution was likely to take once its mission was clarified. These efforts to identify the institution's implicit values played a major role in the success of the process. Other factors were the use of a structured planning model and the fact that as much attention was paid to the political aspects of planning as to the technological.

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Description of the Non-strategic Environment

The university began as a small, church-related seminary one hundred years ago. It evolved into a church-related college, then an independent college, and finally into a university in 1979 when it added graduate programs. The school has fewer than 2000 students and about 60 full-time faculty, a quarter of whom hold the Ph.D. degree.

The school is relatively non-selective in its admissions policies, accepting most students who apply. It encourages those who do not meet the admissions criteria to attend for one semester as non-degree seeking students and then be reevaluated. These admissions policies create tension between the faculty who believe that the school admits students who lack the skills needed to succeed and the faculty whose overriding concern is declining enrollment.

The university began suffering a serious drop in enrollment in 1978. In response to the declining enrollment, it made significant efforts to attract part-time students. As a result, part-time enrollment has grown from about 20 percent to 52 percent of the total enrollment.

There is sharp disagreement on campus as to whether increasing the part-time enrollment has helped the institution since part-time students pay a per-credit rate that is only half of the per-credit rate paid by full-time students. Some people believe that the offering of associate degrees and certificate programs and the fact that the average age of the students is over twenty-five give the institution the feel of a community college. This may make the traditional students less willing to pay the more than $12,000 a year that it costs a residential student to attend. There is also disagreement on campus concerning whether the school deserves the appellation "university" and whether it ought to, or can really afford to, offer graduate programs.

The school has a very small endowment. This fact, plus the relatively low tuition when compared to other private schools, results in a budget deficit of about 1.5 million dollars a year. Most but not all of the deficit is made up by the community via an annual fund raising drive. The year after year inability of the institution to balance its budget, however, has caused a crisis in confidence in the community. As a result, donations have declined each year. The budget deficit also renders the institution ineligible for many foundation grants.

It was in this context that the regional accreditation association evaluated the university in late 1987. In addition to its concerns about the financial stability of the institution, the confusion over mission, and the proliferation of academic programs, the accreditation team expressed concern about the university's library. "The library," the team said, "is not adequate to serve the needs of your seniors and graduate students."

In response to the accreditation team's concern about the library, as well as other concerns about the library that had been raised by several constituencies on campus, the president decided to create a new organizational unit "information services" comprised of the library, telecommunications, and academic and administrative computing. I was asked to head the new unit and to develop a plan to improve library services. One month later the president left the university. An interim president who made it clear that he would not accept the permanent position was appointed.

My intention was to create a strategic plan for the library that would earn the support of the student body, the faculty, the administration, and the Board of the Trustees. But, I felt hampered by two constraints:

* the lack of stability in leadership; (All of the eight administrators who had interviewed me in 1986 had left the school. Some positions (Dean of Students, Dean of Admissions, Dean of Arts and Sciences, Director of Advancement) had turned over three times in three years, and the current president was only temporary.)

* the lack of an agreed-upon mission. (As the new president stated: "This lack of a mission is not for want of trying. It's because the university is factionalized, and each faction vehemently defends its idea of what the mission should be.")

In my studies of strategic planning for IS, I had noticed that most authors assume that the institution has a clearly defined mission and that the administration is relatively stable. They then frame the problem in terms of making sure that the plan for information systems is compatible with the mission of the institution and that it has the support of the administration. I was unable to find any advice as to what to do if the institution lacks a mission and the administration changes annually.

However, it was clear that any plan that was not strategic for the library was unlikely to succeed, given the severe financial straits of the university, the intensity and negativism of the various campus factions, and the loss of the president who had initiated the project. I decided to go ahead with the strategic planning process despite the lack of a strategic vision for the university as a whole, but to build into the planning model an effort to determine the core values of the university and the directions it was likely to take in the upcoming years.

Developing the Plan

The strategies used to develop the plan were based on those recommended by James Penrod at a CAUSE/EDUCOM workshop. They are designed to increase the probability that a plans's goals will be achieved. These strategies include: (1) gain legitimacy for the process before you put the plan together; (2) assemble a powerful planning team; (3) give the team responsibility for determining the strategic decision areas, identifying strengths and weaknesses with respect to those areas, selecting appropriate opportunities for change, and establishing priorities and timelines; and (4) identify a few high potential and reasonably priced applications of technology that can be implemented before the plan is completed. I modified step #3 to include "identify the institution's core values and likely future directions."

The first strategy in Penrod's model is to gain legitimacy for the planning process. I began by asking the university's chief academic committee, which is chaired by the provost, to disband both the old Computer Advisory Committee and the Library Committee and then to establish a new committee, the Information Services (IS) Committee, to plan for all information services. The provost let the faculty know that we would not be filling the vacant librarian position until this new committee decided what kind of librarian the institution needed, and that the first task of the committee would be to develop a strategic plan for the library. Since the previous library director had made all hiring decisions unilaterally, this announcement sent a clear message that the library was entering a change mode and was willing to surrender some autonomy in favor of a rocket thrust forward.

The next strategy in the Penrod model is to put together a powerful planning team. Since the Information Services Committee would serve as the planning team, I made sure that the faculty appointed to the committee were held in high respect by the rest of the faculty but also could be counted on to press for change. The Student Government appointed five

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articulate students who were dissatisfied with library services. Since the library suffered from inadequate electrical service and the plant and property department claimed that this could not be remedied, I asked the director of plant and property to serve on the committee -- and he was overwhelmed. "No faculty group ever asked me to join it before," he said. Thus, the committee consisted of five activist students, five outspoken faculty, the acting library director, the director of plant and property, and me.

It was this committee that was charged with uncovering the institution's implicit core values and likely future directions. In order to do this, the committee members decided that they needed to know:

* the provost's vision of where the school ought to be in five years;

* the number and characteristics of the students now served and those the school <u>expects</u> to be serving five years from now;

* the skills and attitudes the students have when they enter and those the university wants them to have when they leave;

* the school's current and desired competitive edge;

* the academic programs that contribute or should be contributing to that competitive edge.

The committee used three methods to obtain the information it needed to answer these questions. The first was to identify, collect and review relevant published documents. These included: Board minutes, consultant reports, student evaluations, the institutional self-study, the long-range plan, the college catalog, and the viewbook.

The committee also analyzed quantitative data. This information included historical and current enrollment figures, staffing patterns, the standardized test scores of the freshman class, and other data concerning the skills of entering and graduating students. The committee also interviewed academic decision makers. In addition, individual members of the committee held many informal discussions with faculty, especially those who had been here for many years and those in programs that seemed to be flourishing.

The committee eventually decided that most people in the university community believed the following things about the school:

1. The students the university serves are of average academic ability and usually come from homes where the parents have not graduated from college and little scholarly activity takes place.

2. The faculty intends to develop in these students a respect for learning, the ability and the desire to engage in self-directed learning, and the knowledge and skills needed to have successful careers. Opinion is divided as to how successful the school is with respect to these intentions.

3. The most popular programs for full-time students are business, health sciences, and teacher education; these are likely to continue to be the source of most of our full-time students.

4. The university is in poor financial condition and needs about 1000 full-time students in order to be in good financial shape instead of the current level of 700 full-time students. Part-time students generate marginal revenue, but, due to the competition of nearby low-cost state colleges, will never provide significant income to the university. The budget for the coming fiscal year assumed a fifteen percent increase in full-time students, but most people interviewed doubted that the full increase would be achieved.

5. Two of the four graduate programs are not competitive and unlikely to become so. The remaining two programs are currently competitive but changes in the tax laws and increasing competition from low-cost state institutions may decrease their competitiveness.

6. The market in which the university operates is extremely competitive. Even those faculty who believe that the school does achieve its intentions with respect to student outcomes asserted that greater efforts are needed to improve the academic programs and to market these programs successfully.

Once the IS Committee decided upon the six beliefs concerning the core values and the directions the school was likely to take in the future, it began to examine the relevance of the current mission of the library with respect to these

values and directions. As part of its evaluation of the mission, it looked at the nature and quality of information services provided by schools that served similar students. And, it analyzed emerging trends in information technology to see which of these trends had the potential of facilitating the educational goals of the institution.

For example, the IS Committee learned about CD-ROM; electronic retrieval of full-text documents; regional and national resource sharing networks; inter-library loans of periodicals done over a telephone line, from PC to PC to student's floppy disk; librarians as teachers; and information management literacy replacing computer literacy as the focus of the 90's. They also learned the true costs of acquiring a book or periodical (the cataloging, shelving, and storage costs as well as the initial costs) which helped them to understand why the emphasis in modern libraries is moving from quality of acquisitions to quality of access.

After examining these exciting possibilities, they had to come back to earth, to the values of the institution and the realities of limited resources. But this process of imagining the possibilities helped the IS planning committee form a vision of the role the library could play in enhancing institutional vitality.

The IS Committee also worked hard to identify the library's strengths and weaknesses. It assessed the political and cultural environments as well as the technical environment in order to determine the strengths and weaknesses. Then, using information about the university's values and likely future directions, the library's strengths and weaknesses, and trends in information management and information literacy, the IS committee set about redefining the mission of the library and creating a vision of what the library could look like in the 21st century. It saw the new mission of the library as having three components:

Technical: The library provides the university community with timely, convenient, cost-effective access to scholarly information.

Instructional: The library plays a key role in assisting university students in the development of information competencies.

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Physical: The library provides a place conducive to discovery and self-education outside the classroom and laboratory.

The committee's vision of the library in the 21st century was based on the three components of the mission statement. (Special thanks to the MIT libraries for providing the IS Committee with some of the ideas and phraseology that shaped the vision.) This vision is:

The Library as a Place:

In a small liberal arts college, the library serves many functions: social, cultural, and academic. Of special importance to the experience of a liberal arts education is the library as a place: a building housing physical collections that can be accessed easily by the university community.

The university's library in the 21st century will continue to be a place for self-education and discovery; a place whose physical appearance proclaims a reverence for knowledge; and a place that serves as a haven from the pressures of communal living.

The 21st century will see the increasing importance of the library as a place where the university community obtains access to information resources located outside the physical boundaries of the library.

The Librarian as an Information Guide:

By the beginning of the 21st century, the major role of a university librarian will be as an information guide through the increasingly complex maze of information. Through course related and course integrated instruction, librarians will assist in the education of students in the structure of information in their field, in finding cost effective strategies for retrieving that information, and in enhancing their ability to use information in life-long learning.

Librarians will assist faculty and staff in the selection of and access to information services provided by external vendors. These information

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services often will be supplied directly to the individual's office or home workstation.

The Library as an Organization:

The pace of change in the information world will require flexibility in assigning library staff and services. Skills will be more important than credentials. Staff development will be an essential component of the library budget. Measures of the quality of access to materials will replace the number of volumes in the library as a yardstick for excellence.

At this point in the project, the IS committee had reached a working agreement on a set of beliefs about the university that it believed were core and commonly held by all, or almost all, factions in the university. It had used these core beliefs and its knowledge of trends in information science to redefine the mission of the library and to create a vision of what the library should be like in the 21st century.

Its next step was to define strategic goals in support of the mission and the vision. It is to this set of goals that it would ask the faculty, administration, staff, students, and Board to commit, and it is this set of goals that would drive the objectives and the activities of the library for the next three to five years. These goals are listed below:

* Become an active participant in local, regional, and national information networks.

* Offer a comprehensive instructional program in information management that will assist students in each of the university's majors to become effective and efficient managers of information.

* Develop an organizational structure that will allow the library to quickly and effectively respond to the changing characteristics and information needs of the university community.

* Remodel the library in order to create a flexible, comfortable environment and to facilitate access to a variety of information sources.

* Develop successful proposals to external agencies to fund library projects.

* Develop and manage collections of materials essential to the instructional programs of the university.

The next step was to define the 1-year and 3-year objectives that needed to be accomplished in order for the library to achieve its strategic goals and fulfill its new mission. The IS Committee made sure that each objective was closely tied to the core beliefs about the university and to the library's new mission and strategic goals. For example, one of the 3-year objectives is:

> have in place a comprehensive multi-leveled information management instructional program that will begin with the freshmen seminar and intensify and become major specific as the student moves through the university. The program will include focused library services and instructional materials, as well as formal and informal instruction, and will be designed to assist the student in the development of life-long learning skills and attitudes.

This goal is clearly related to the belief that the school's students are first generation college students who come from homes where scholarly activity is not the norm. It is also related to the faculty's goals to promote life-long learning and to provide students with the knowledge and skills needed for successful careers.

The fourth strategy in Penrod's model involves implementing inexpensive but exciting projects during the plan development phase so that people can see that progress is being made. We decided to install CD-ROM workstations that featured electronic indices of interest to students and faculty in business, health sciences and teacher education. The development office and the colleges of business and health sciences helped to obtain the money for these projects because they had been kept involved throughout the planning process and were excited about the goals. The installation of the first workstation was a minor wonder on the campus. Comments like "I never thought I would see the day" were heard from students and faculty who came to view it.

<u>Evaluation</u>

The strong relationship between the plan's goals and those of the university made the critical difference in winning the support of the faculty, students, administration, and Board. All of the one and three-year objectives were achieved on schedule. While the project was quite successful, it was also

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traumatic for the library staff. Greater effort should have been made to involve the library staff in the planning process.

Since the IS committee identified six beliefs about the school and used these to guide the development of the strategic plan for information services, it might be interesting to reexamine the six beliefs. A new permanent president has been in office for one year, and he has been attempting to identify a strategic mission for the school. He has travelled throughout the country meeting with alumni groups to get their input and has held many other meetings on campus and in the community. The Task Force that he appointed to consider the strengths and the mission of the school eventually agreed upon most of the same beliefs that the IS committee had uncovered.

The one major difference concerned the programs of competitive advantage. The IS Committee believed that these are teacher education, health sciences, and business. The Task Force agreed that the school has a competitive advantage in its health sciences and business programs, but it is debating whether teacher education may be on the decline and may be too expensive a program to maintain. The Task Force has recommended that the school consider developing a Center for Government Studies to take advantage of the school's location in sight of the state capital and its many warm relationships with the legislature.

The Task Force agreed with the IS Committee that a significant increase in the number of full-time students is necessary in order for the university to achieve financial stability, and it has deemphasized part-time and graduate students. It has stressed that the number of full-time students will increase only if the university focuses on its programs of competitive advantage and improves academic quality - all goals of the strategic plan for information services.

While we will never know what would have happened if the IS Committee had developed an IS plan without determining the core values and likely strategic directions of the university, it seems evident that determining and then using these values and directions as a foundation for the IS strategic plan facilitated its acceptance by the university community and enabled the acquisition of the resources needed to attain the plan's goals.

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THE BIOMEDICAL INFORMATION COMMUNICATION CENTER: PLANNING AN INTEGRATED ACADEMIC INFORMATION MANAGEMENT SYSTEM

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ABSTRACT

The Biomedical Information Communication Center (BICC) at the Oregon Health Sciences University (OHSU) combines academic computing, the library, biomedical communications, and medical informatics, to serve medical, dental and nursing faculty, students and staff. As a National Library of Medicine Phase III IAIMS (Integrated Academic Information Management System) site, the BICC has conducted needs assessements and planned for an information technology system to provide desktop access for users campus-wide on a variety of platforms. Projects to accomplish this include a campus-wide StarLan network; ORHION, an electronic information service; and a campus-wide database system. Concurrent with this planning is construction of a BICC building, which, when ready next year, will serve as a base for these integrated systems. By equipping health care students and professionals involved in education, research, and patient care with access to information technology, the BICC can achieve its goal of supporting the provision of quality, cost-effective care in Oregon.

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INTRODUCTION

The Biomedical Information Communication Center (BICC) at Oregon Health Sciences University in Portland is the campus-wide organizational entity for information technology. It combines academic and administrative computing, the library system, biomedical communications, telecommunications, and health informatics research and development under one person who serves as the chief information officer for the university.

Oregon Health Sciences University (OHSU) is one of eight schools in the Oregon State System of Higher Education. It combines schools of medicine, nursing, and dentistry with three research institutes, a children's center and two hospitals. While bachelor's degrees are awarded through the School of Nursing and allied health departments, the campus is primarily graduate level.

THE OREGON HEALTH SCIENCES UNIVERSITY. OHSU recently distributed a long range strategic plan, encompassing educational, research, clinical care, outreach and community service goals. [1] The goals reflect OHSU's role as the only graduate health education institution in Oregon, and one of only two in the Pacific Northwest. There are approximately 6,000 physicians and 30,000 other health related professionals in the state. OHSU serves these groups in several ways, including continuing education and information services and as a referral resource for clinicians in the field. Information use on campus is intense because educational, research and clinical care needs are great.

THE BICC. Begun in September, 1989, the BICC is a unique joining of diverse information services which can now be closely coordinated because they are part of the same organization. It is considered one of the three research institutes on campus and is separate from any one of the three schools.

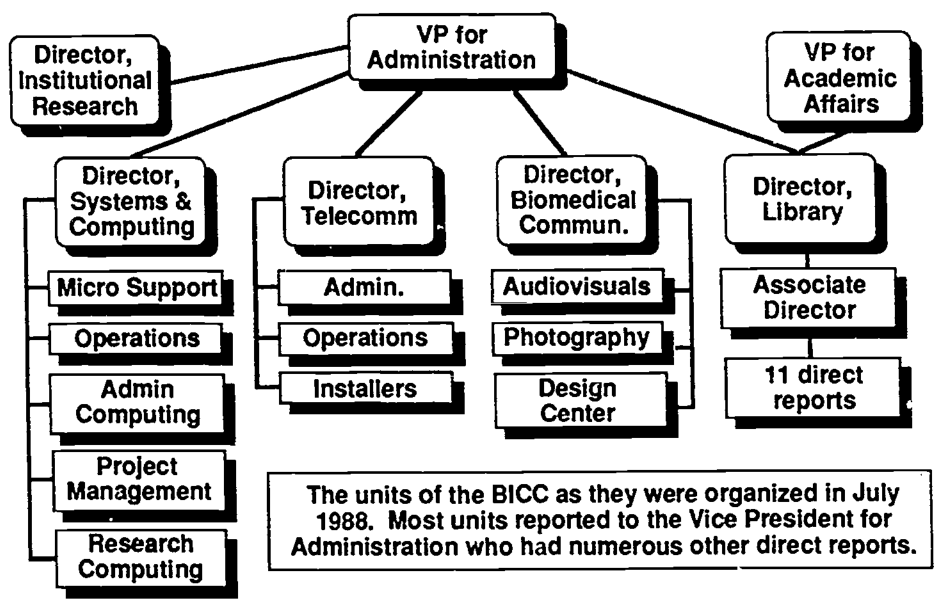


Figure 1.

Prior to the BICC, the different information units on campus reported to different vice presidents and were somewhat isolated (see Figure 1). The library collaborated regularly with Biomedical Communications and also with Systems and Computing while implementing an automated library system, but areas such as Telecommunications were not similarly integrated. Coordination was difficult because of incomplete or inaccurate knowledge of other departments. Computing activities, for example, were fragmented and spread among a systems and computing department, a research computing department, and an instructional media department housed in the library which provided public use microcomputers. Hospital information systems remains part of the hospital and outside the BICC and the physical plant department still does some hardware repairs, but most campus computing is now together under the BICC.

THE BICC AS AN INTEGRATED ACADEMIC INFORMATION MANAGEMENT SYSTEM

In 1982, a landmark publication from the Association of American Medical Colleges (AAMC) documenting a study done for the National Library of Medicine (NLM) had a profound impact on academic health sciences centers across the country. The principal investigator for this study was a health sciences librarian, Nina W. Matheson, M.L.; project directors were John A.D. Cooper, M.D., Ph.D. and Marjorie P. Wilson, M.D., both from the AAMC. Titled Academic Information in the Academic Health Sciences Center: Roles for the Library in Information Management, the paper recommended that 1) integrated information management networks be utilized to draw on academic, operational and clinical information and 2) academic programs be developed to teach faculty, staff and students how to use information technology. [2] The National Library of Medicine acted quickly to provide leadership in creating what it termed Integrated Academic Information Management Systems (IAIMS). To stimulate academic health centers to study the way information should be handled, it offered grants for IAIMS planning. William Stead, M.D., IAIMS director at Duke University, has written, "A strategic planning process provides the opportunity to guide decisions about individual projects so as to bring them together as an applied IAIMS laboratory." [3]

Originally it was thought the institutions that succeeded in receiving grant funds would provide a single model for others. Actually, each campus has developed its own unique IAIMS program. While some focus on the library, with data from elsewhere being merged with bibliographic data, others are more clinically oriented or more inclined towards biomedical research. Nevertheless, IAIMS has been widely hailed as a successful project. The NLM initiative has changed the way work is done at more than just the grant funded institutions. The concept has now spread to such an extent that hospital libraries are being funded by NLM to do similar studies. Grants are awarded for Phase 1 studies, which are planning grants; for Phase 2, model development; and for Phase 3, full implementation. Institutions must reapply for each phase since the grants are extremely competitive.

OHSU is presently one of five institutions in the implementation phase, with somewhat over $5 million to use over a five year period. In addition, Congress has appropriated $14.5 million for a building to house the new BICC. The BICC is unique in that it is the only Phase 3 IAIMS site with this combination of resources and the only one with a statewide outreach mission. Thus, it can build on what others have done to integrate information on their campuses, but will explore new ground in offering these services on a statewide basis.

IAIMS PLANNING AT OHSU

The OHSU campus began its official planning phase for the BICC in 1984 when it was awarded a planning contract by NLM. The president of the university formed two committees to assist in the effort: a National Technical Advisory Committee made up of experts in business, information technology, and informatics, and a Faculty Advisory Committee of campus individuals. After deciding on some initial directions for BICC planning, the committees proliferated under the guidance of a new acting president in 1987 to become 11 different groups totalling nearly 100 people. There was an Interdisciplinary Oversight Committee similar to the National Technical Advisory Committee and a Planning Committee made up of chairs of nine task forces plus the task forces themselves. Each task force generated a report on a specific area of planning (telecommunications, databases, vendor opportunities, etc.) and these were molded into an IAIMS Phase 3 proposal submitted to NLM in 1988 and awarded in June, 1989.

The university now had IAIMS implementation grant funds in one hand and a brand new strategic plan for OHSU in the other. In addition, it had just hired J. Robert Beck, M.D., a medical informatician and clinical pathologist, to head the new BICC. He accepted the dual task of merging the different information services departments into one unit and of launching an aggressive IAIMS effort. In addition, he is leading the planning effort for a new building, to be completed by June, 1991.

PRESENT BICC SERVICES

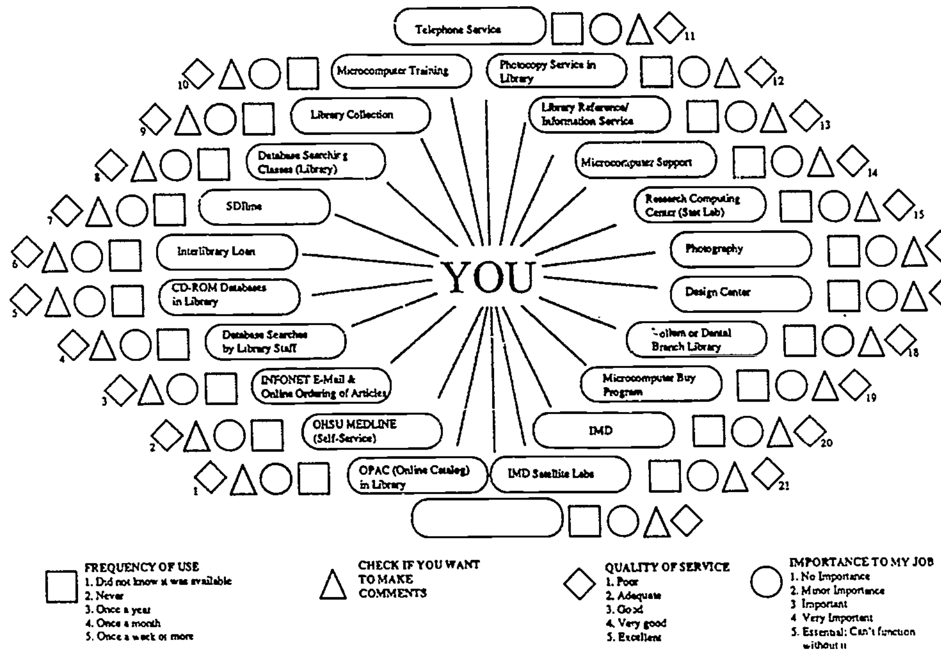


Figure 2.

NEEDS ASSESSMENTS. Once the BICC director was on board, needs assessments became the first order of business, so that Dr. Beck could become more familiar with the areas under his control and with the desires of the BICC's clientele. In the fall of 1989, three needs assessments were done to gather information from users. The first studied current on-campus users of BICC information services. BICC staff generated a random sample of 100 faculty, residents and students and trained volunteer interviewers. Three graphical survey instruments were developed, based on one used at Dartmouth Medical School, another IAIMS site. The first two survey instruments were designed to help evaluate present BICC services (see Figure 2) and to identify the enhanced services which would be most useful. Services, such as microcomputer training or database searching, were listed and respondents rated items on the list concerning their present quality or future usefulness and desirability. The third instrument included a list and explanation of possible future BICC services and asked for ratings. The interview method was selected so that interviewer and interviewee could continuously interact. Interviewers volunteered from all areas of the BICC; one of the most gratifying aspects of the survey project was the synergy among the surveyors as they were trained.

The on-campus survey revealed that the BICC must improve its present information services. It also indicated the need to offer enhanced services soon and well because expectations are that the advent of the BICC as an organization will have immediate benefit to users. There was a clear cry for more training and support for microcomputer use on campus. With the installation of a campuswide data network in progress, this need has become even greater.

To assess the needs of health professionals throughout the state, the BICC education coordinator conducted four focus groups in smaller Oregon towns during November and December, 1989. The focused group interview technique has been shown to be effective in market research and is another way to assess needs efficiently over a short period of time. The groups discussed what kinds of information they most needed and the technologies they were willing to use to access this information. The BICC differs from other IAIMS sites in that it has a mandate to serve the entire state. Outside of the Willamette Valley, the state is primarily rural, so mechanisms for providing electronic information to these remote areas, so hard to reach physically, are of critical importance to fulfilling the mission. From an organizational point of view, outreach services must be targeted differently from campus services. For example, continuing education via video or computer was high on the list of desired BICC services for these users but not for campus personnel who have it readily available.

Finally, the needs of BICC personnel were assessed via over 100 individual staff interviews to ascertain current job duties, perceived needed changes, special skills, career aspirations, and present and desired roles within the BICC. Interview forms were completed but were seen only by the BICC director and two coordinators to protect confidentiality. An overwhelming conclusion with organizational implications was that staff members were expecting change and most were hoping for new roles. There was great desire for the organizational structure to be clarified soon to reduce uncertainty. There was a certain amount of anxiety expressed as well. Nearly every interviewee desired more education and/or training in technical areas, particularly microcomputers. A large number volunteered to teach courses in their area of expertise in exchange for training from other departments. An immediate response from the BICC was to open all courses offered at that time on microcomputer applications and library training free to any BICC staff member.

REORGANIZATION. After conducting the needs assessments, the reorganization team, which consisted of the coordinator for planning and personnel and the communications coordinator, created a BICC organization model, based on identified goals and the findings of the needs assessments. The reorganization team presented its proposal to the BICC executive committee. This group, made up of the Director, Associate Directors and Administrative Officer, evaluated the proposal and made final changes. The Associate Director of each division in turn presented it to their middle managers and department heads for further refinement. The final draft was then presented to BICC staff in two ways: on a one-to-one basis by immediate supervisors and in an all-staff meeting in January, 1990. On the assumption that radical restructuring brings rapid change, [4] the target date for full implementation was set as July, 1990.

Before the BICC existed, the libraries, telecommunications, and the computing center existed separately and had varied reporting relationships. They comprise the largest BICC departments in terms of dollars and staff. In addition, the BICC was given oversight of Biomedical Communications (audiovisuals, photography, and graphic arts), microcomputer support (public use microcomputer areas, training and microcomputer store), and research computing and biostatistics support.

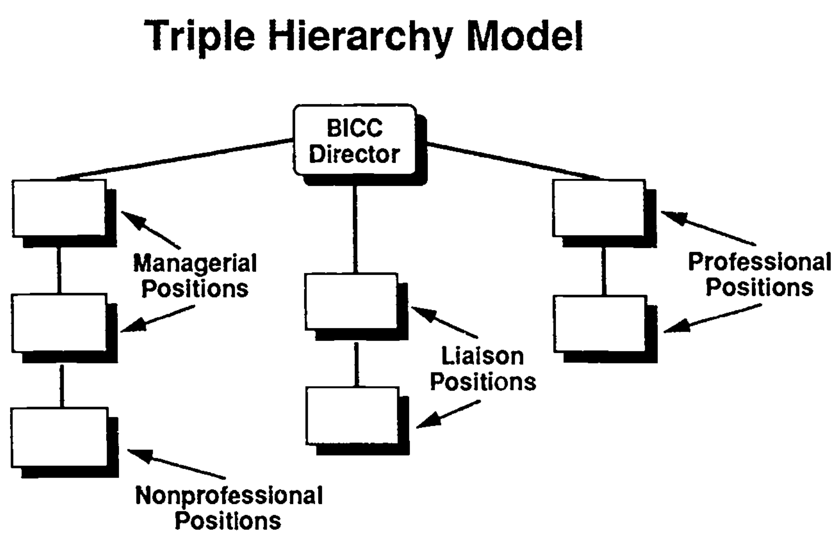
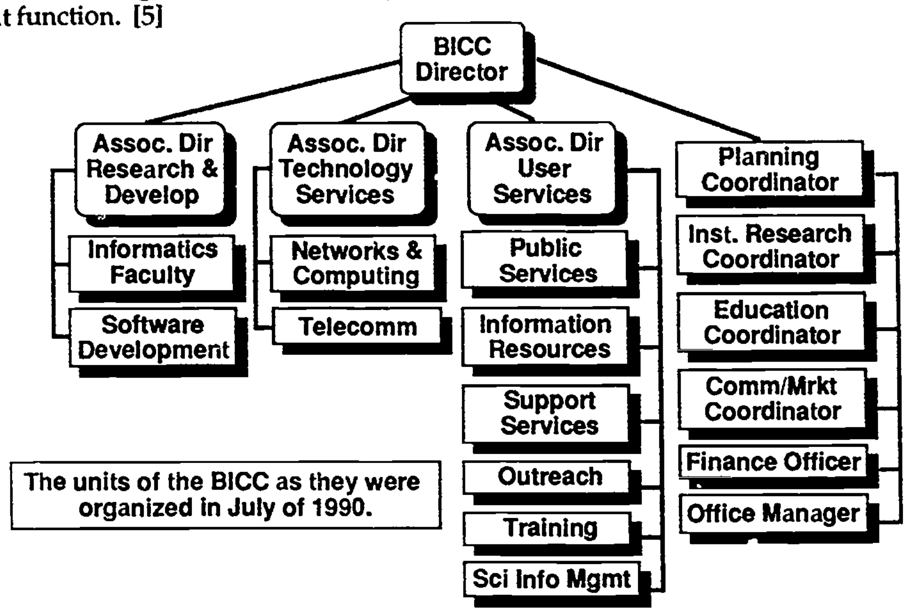


Figure 3.

The new BICC organization is a triple hierarchy (see Figure 3). Where a dual ladder hierarchy allows professional staff to advance in their careers as technical specialists or as managers, the triple hierarchy adds another dimension, the liaison hierarchy. As examples, a UNIX applications specialist is on the technical ladder, the manager of Photography is on the line management ladder, and the Training Coordinator is on the liaison ladder. This type of organization has been implemented with success in high-technology firms. There is a hierarchical organization chart which forms a focus and base for staff who need structure. However, project staff are drawn from all departments in a matrix management sense. There is an expanded central staff of coordinators as well as coordinators

within User Services. They handle areas with a high potential for conflict such as the purchase of expensive equipment, the coordination of performance appraisal and rewards systems, budgeting, project management assignments, statewide services, public relations, and training. The intention is that professionals on the staff, whether they be librarians, computer scientists or biomedical photographers, will be given more autonomy and more opportunity to advance regardless of their management function. [5]



The units of the BICC as they were organized in July of 1990.

Figure 4.

Under the new organization the BICC is divided into three divisions: User Services, Technology Services and R>search & Development (see Figure 4). In addition, there is a central administrative core. User Services has six areas: support services (photography, audiovisuals, the microcomputer store and support), microcomputer training, outreach activities, research computing and biostatistics support, public services, and information resources. The latter two areas correspond to public services and technical services in a traditional library. Public Services includes reference, circulation, interlibrary loan and photocopy services. Information Resources combines cataloging, serials and acquisitions functions. User Services can be considered the expanded library. The Associate Director for User Services functions as university librarian, but he has vastly expanded responsibilities because his division includes microcomputer support, biomedical communications and microcomputer training. The graphic arts department, formerly part of Biomedical Communications, was phased out last year in favor of teaching users to use graphics software themselves or referring them to private artists as a cost saving measure. Middle level managers handle support services, public services and information resources, each of which includes several departments. Other activities, such as outreach services, are managed by "coordinators" who perform liaison activities in staff roles reporting directly to the Associate Director.

Technology Services was divided into two main areas: telecommunications, and networks and computing. At the helm is an Associate Director with a background in the high technology private sector and entrepreneurial enterprise. Whereas this division does not include the variety of departments User Services has, it controls the largest budget and manages most of the project work. The telecommunications area includes the central switchboard and paging system for the university and the installation and maintenance of voice technology. With the installation of a new voice system on campus this year, it has become the university's own phone system. The campus was wired for data communications simultaneously. The two departments have been working side by side to complete the installation and organize related projects. As a result of anticipated growth in the networking arena and to keep end user services together, most training and microcomputer activities have been taken from Networks & Computing and put into User Services. This was not a popular move in the beginning because of some territorial problems, but has now been accepted as a logical result of the reorganization.

Research & Development is currently the smallest unit of the BICC. In addition to the health informatics faculty and their staff, a software development group is housed in this division. It is anticipated that the department will recruit more faculty, will begin a fellowship program, and will be the incubator for new products which can then be implemented by Technology Services and offered to users by User Services. An example is the physician's workstation project where BICC staff are developing a graphical user interface and other software to easily access clinical and bibliographic information from the same platform. Thus the BICC is a concentric organization, with Research and Development at its hub, the service departments in the second layer, the university clients in the penultimate position, and Northwest health professionals the ultimate end users of BICC products and services (see Figure 5).

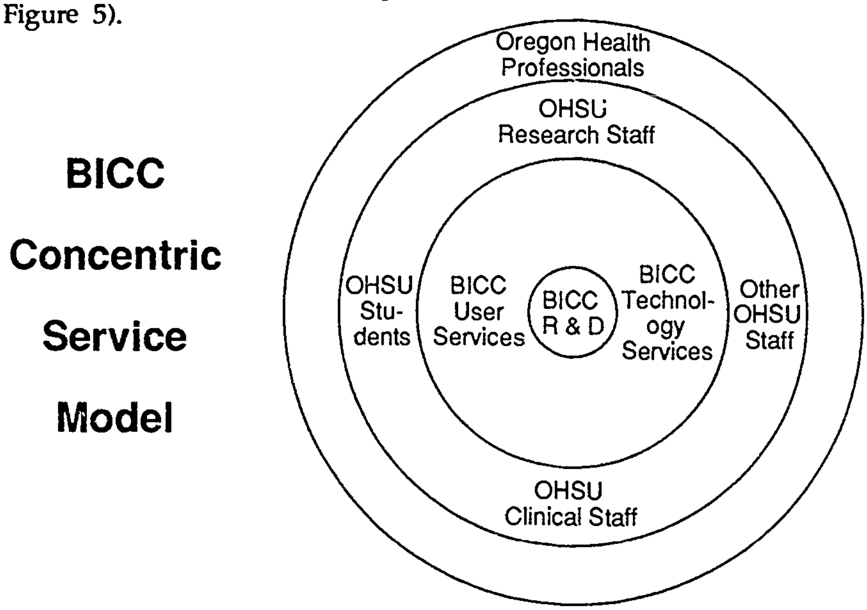


Figure 5.

THE NEW BUILDING. During the initial planning phase for the BICC, the conceptual design for the new building became increasingly clear. It was evident that a large part of the library operation would be housed there, but only the most used items in the collection would be moved in anticipation of full text retrieval becoming available at some point to provide the less used items. It was also clear that considerable space would be allocated to a training and teleconferencing center so that teleconferences could be held with underserved areas outside of Portland. The microcomputers for public use will be located near a microcomputer store and display area with training and support staff readily available. In addition, the health informatics staff and BICC administrative staff will reside on the top floor. This mix of functions mirrors the IAIMS concept. It reflects a true integration of information services. A location for the building was selected in the center of the campus with bridges to both sides of the campus. The location echos the philosophy that information is central to the educational, research, and patient care responsibilities of the university.

Groundbreaking took place in August, 1989. At that time, interior space planning had not begun in earnest because the director was not yet on board. Instead, the shell had been designed and the interior envisioned in a flexible way. Space planning involved virtually all staff once the reorganization was clear. A contract for furniture, signage and miscellanous office equipment will be let by January, 1991. The building will have five levels in addition to a mechanical level for the larger machines. The first level is the training/teleconferencing space. The second level will house a library collection in compact shelving. Library services and current journals will be on level three, the main entry level. The fourth level will have microcomputer services, including the store, training, support and self service equipment. The west wing of floors two, three and four will house BICC staff offices. The BICC administrative and research and development staffs will live on the top floor. The reorganization was done so that functions which directly serve the public could be moved in toto to the new building. This provides "one stop shopping" for information services to any client who walks through the door.

IMPLEMENTING AN INTEGRATED ACADEMIC INFORMATION MANAGEMENT SYSTEM

As the BICC prepares to move into its new building, it also is working to link the OHSU campus electronically. A campuswide network is essential to becoming a true IAIMS. The Oregon State System of Higher Education has recently provisioned each of its eight campuses with a new telephone system. OHSU chose to install data as well as voice capabilities at the same time, with a successful move to an AT&T System 85 Voice and Data Switch on April 28, 1990. AT&T premises distribution wiring has been completed, and 30,426 feet of fiber and copper wiring have been installed underground to all campus buildings. Individual buildings continue to be wired, with 120 wiring closets rewired and modified to accept not only telecommunications, but also the BICC and the Hospital Information Systems Division (HISD) networks. While HISD had already installed the Token Ring System in the hospital and clinic areas, the rest of OHSU is using the AT&T StarLan Ethernet 802.3 network, partly a result of AT&T's donation of nearly $1 million in network equipment. Obviously, a link between the two systems is a high priority so that patient data from the hospital can be integrated with other types of data generated by the academic side of campus. This is in progress. With nearly 150 users connected to date, the StarLan network now connects terminals, DOS machines, Macintoshes, Suns, a Sequent, NeXT computers, a Harris, an HP, and AT&T 3b2 computers. The number of NeXT computers on the network will expand because the BICC recently formed a partnership with NeXT Computer, Inc. to use the NeXTstation for development work on the physician's workstation.

The network is assisting with the integration of BICC staff functions in a critical way by promoting communication among geographically separate units. All BICC departments are now connected, although some staff do not have their own computers. Electronic mail has been especially effective in promoting horizontal communication across the organization.

OUTREACH. As a high priority in the OHSU Strategic Plan, outreach efforts by the library over the past ten years have paved the way for an electronic information system, ORHION (Oregon Health Information Online). ORHION provides users with a number of electronic services, including Medline (Medical Literature Online from the National Library of Medicine) searching on a locally tailored subset, automatic requesting of photocopies to be charged to a credit card or OHSU account, the online public access catalog of the library, and a growing list of other services. While an older project, Infonet, funded by the Meyer Memorial Trust, began two years ago to offer many of these online services to campus users, the expanded and renamed ORHION service went statewide in April, 1990. The service, offered free on campus, has been measurably successful, with over 850 users registered. Subscriptions are now available off-campus to hospitals and end users, with the result that there are now 19 paid off-campus subscribers and six trying the system on a trial basis. ORHION implementation has required cooperation and communication between User and Technology Services for the customer and technical aspects of the project. For example, when ORHION services were moved from a PDP-11 to a Sun machine, Networks & Computing did the technical work and User Services helped users learn how to access ORHION from the new machine. Campus users can now access ORHION directly on the StarLan network. As the range of ORHION services broadens to include more databases, decision support data, drug interaction data, educational conferencing, etc., ORHION will form the electronic highway between OHSU and health professionals throughout the state.

Through ORHION and other services the BICC supports the education of OHSU students off campus. Recent funding for the development of Area Health Education Centers in Oregon will allow medical and nursing students to take part of their clinical training in rural areas. The BICC will provide essential electronic contact between the students and the OHSU campus. It is probable that less expensive networking will be available through a state program called Ed-Net, which will connect Oregon's schools, from elementary through graduate, for purposes of data and video transmission. Other users, such as hospitals, will be able to send and receive information as well.

ORACLE AS A DATABASE STANDARD. A recent site license agreement between OHSU and Oracle provides the full suite of Oracle products (excluding the manufacturing and financial applications) to OHSU for the next four years. Oracle was selected because it is compatible with the heterogenous computer environment at OHSU and interfaces with existing applications. The BICC is actively planning for marketing, sales and distribution, installation and conversion, training, support and custom programming. This software can run on all hardware platforms currently on campus. By standardizing on Oracle database software, OHSU will be able to integrate database resources across campus more easily.

THE SYNTHESIS PROJECT. Another project critical to the success of the IAIMS program is called Synthesis. Synthesis will provide a computing environment in which users can seamlessly access the BICC network, capture authorized data from a variety of sources, format the data into information, and deliver the information to the user. The project is well underway with a project team already in place and a timeline clearly delineated. Initially Synthesis will capture data from laboratory tests and patient demographic records. A joint effort of Clinical Pathology, the Hospital Information Systems Division and the BICC, the project will involve a number of computers including an AT&T 3b2/1000, a SUN Sparcstation 1+, Clinical Pathology's Stratus computer, and the University Hospital Amdahl computer. A gateway between the hospital Amdahl computer and the StarLan network has been established as part of this project.

EVALUATION

The IAIMS planning process at OHSU includes both formal and informal mechanisms for evaluation of BICC information services. The help desk for campus computer support and a customer support line for ORHION, both basically phone services, gather input on a continuing basis concerning support functions. Formal evaluations are planned for each individual BICC-wide project as part of the project management scheme. Within the BICC, job satisfaction is measured by an annual interview survey of all staff conducted as a follow-up to the initial personnel survey. On campus, an IAIMS Advisory Committee, with members from the teaching and research faculties of the three schools, University Hospital, and the VA Medical Center, plan evaluative mechanisms for BICC IAIMS services. The BICC hopes to evaluate the impact of IAIMS activities off campus if funding can be provided. A needs assessment proposal outlines two assessments, one next year and one three years later, to compare information management before and after ORHION becomes widely used.

EXPANDING THE BICC'S ROLE AS AN IAIMS

Plans for the future include support of the OHSU Strategic Plan in several ways. First, to assist in reaching the educational goals of the university, the BICC will continue to hold its annual Information Technology for the Health Sciences Conference, which began in 1989, and will also develop continuing education programs in information technology, establish an information based education infrastructure, and develop a program in health informatics. To support the research objectives, the BICC will develop a collaborative center for outcomes research (which tracks patients and their response to medical treatment) and will develop a health informatics research program. In support of clinical care goals, the BICC will continue to provide information electronically both on and off campus. The BICC will play an especially key role in OHSU's reaching its outreach goals by aiding the continuing education programs, the Office of Rural Health and the Area Health Education Centers through the extension of ORHION services to further corners of the state. All of these efforts will be enhanced by development of a suitable workstation which will provide "one stop shopping" for information.

CONCLUSION

Oregon Health Sciences University has spent much of the last decade planning for an Integrated Academic Information Management System which can best meet the needs of its geographically diverse clientele long term. Done within the framework of the OHSU Strategic Plan, BICC planning has been accomplished with National Library of Medicine funds. By equipping health care students and professionals involved in education, research and patient care with access to information technology, the BICC can achieve its goal of supporting the provision of quality, cost-effective health care in Oregon.

ENDNOTES

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CAUSE '90

Reengineering: A Concept for Higher Education?

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ABSTRACT

The introduction of new technologies have throughout history followed a three-stage path before revolutionary changes have been evidenced. First, the new technology does what the technology it has replaced does but faster (transition). Second, the new technology begins to initiate modifications to old processes, resulting in greater efficiencies and enhanced effectiveness (innovation). Finally, new ideas and concepts which were previously impossible have been made possible by new technology resulting in major breakthroughs and significantly increased effectiveness and productivity (transformation or reengineering). To date the majority of changes brought about by computing and communication have resulted from phases one and two of this paradigm. We are just beginning phase three.

Reengineering is the process or reexamining all of our basic assumptions about the way we do things and rejecting those that do not fit the technological capabilities of today; redesigning work processes based upon new assumptions; and "thinking out of the box," that is, refusing to be limited by traditions of the past.

This paper examines the concept of reengineering as it might apply to a college or university campus with particular emphasis upon information management units.

Technological change defines the horizon of our material world as it shapes the limiting conditions of what is possible and what is barely imaginable. It erodes taken-for-granted assumptions about the nature of our reality, the "pattern" in which we dwell, and lays open new choices.[1]

Shoshana Zuboff

INTRODUCTION

The evolution of information technology as presented in Nolan's Stages Theory is broken into three eras. The data processing (DP) era (from 1960 to 1980) was the gestation period for computer technology. During this era, new technology was used to make existing organization structures more efficient. The mainframe was king, centralization predominant, and systems were "provided for" end users. The next stage, the information technology (IT) era (from 1980 to 1995), was founded upon three fundamental infrastructures: (1) IT departments, (2) college and university computer science programs, and (3) a diversified computer service industry. This era has enabled the computer to be brought out of the basement, to empower end users and make it possible to change the way work is performed. The network era is the third stage (from 1995 to beyond 2010). It will serve an information/service economy where knowledge workers are predominant, organizational structures are networked, planning is visionary, intangible values are considered, the competition is global, and information technology is seen as an enabling force. It will be the period of the transformed or reengineered enterprise.[2]

For this is the dawn of the Powershift Era. We live at a moment when the entire structure of power that held the world together is now disintegrating. A radically different structure of power is taking form. And this is happening at every level of human society.[3]

Alvin Toffler

WHY REENGINEER?

In the world in which we now live, capital and/or human resources no longer guarantee success. Service, quality, speed of response and innovation are now the determinants of success. The rapid changes, with which we all must deal, mean that actions based primarily upon past experiences are no longer valid. We have entered a time where applying new knowledge first is key. It is analogous to a "permanent white water" river rafting journey.[4]

Over the past several years, we have invested heavily in information technology. Much of that investment has focused on automation, using technology to mechanize "the business." This has left existing processes relatively intact and simply used computers to speed the time for completion. Unfortunately, many job designs, work flows, control mechanisms, and organizational structures came of age in a very different competitive environment well before the advent of computing and digital communications. The processes were geared to support a bureaucracy and to provide efficiency and control. For the most part, work has been organized as a sequence of separate tasks, and complex algorithms are used to track

progress, discover mistakes, and subsequently correct errors. Such processes have not kept pace with the changes in technology, demographics, or business objectives. It is, therefore, necessary to reexamine outdated processes, and in many cases, do away with them altogether and start over.[5]

> *. . . an informating strategy suggests the need for a more wholistic reconceptualization of the skills, roles, and structures that define the total organization. Partial change efforts . . . are unlikely to result in the kind of learning environment necessary for an ongoing and robust approach to the informating process. . . .managing in an informated environment is a delicate human process. The ability to use information for real business benefit is as much a function of the quality of commitment and relationships as it is a function of the quality of intellective skills.*[6]
>
> Shoshana Zuboff

WHAT IS REENGINEERING?

The concept of reengineering or transformation and other closely related ideas such as restructuring, process design concept (PDC), work or business process redesign, high productivity program (HPP), managing office productivity (MOP) and organizational redesign are relatively new, emerging only in the late 1980s.[7,8,9]

Reengineering can be defined as using the power of modern information technology to radically redesign business processes in order to achieve dramatic improvements in their performance.[10] It requires a new information technology strategy and a radical behavior change throughout the enterprise, not just in information resources units.

The business strategy must focus upon a market driven quality (MDQ) orientation. This involves: (1) meeting customer desires, (2) aggressively moving to practically eliminate defects or errors, (3) significantly reducing cycle or response time, (4) dramatically increasing employee authority, responsibility, and participation in decision-making, and (5) creating new standards of measurement for evaluation.[11] Fulfilling the business strategy requires that there be a linkage between building quality into programs and the IT strategy for the enterprise. This means that information systems can no longer be seen as a business function, rather that the focus must be upon the information that is needed to run the business. It involves a change from managing information systems (IS) as a utility, to managing IS as an agent of change.[12]

The principles of reengineering must be applied to the entire enterprise and some will emerge from the type of learning environment described by Zuboff. A few principles such as the following are already becoming evident.

Organize around outcomes, not tasks. This is a purposeful movement away from the centuries old notion of specialized labor and from the limitations inherent in paper filing systems. It often results in compressed responsibility for a sequence of steps and the assignment of the total function along with appropriate authority to a single person or unit.

Have those who use the output of the process perform the process. This is another example of moving away from specialized labor. Many opportunities exist to change

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procedures so that individuals who need the result of a process do it themselves. When people closest to a process perform it, the overhead of managing it is substantially reduced. Additionally, coordination, liaison, and interfaces between those who perform the process and those who use it can be eliminated.

Subsume information processing work into the real work that produces the information. This disputes the old rule about specialized labor and the assertion that people at lower organizational levels are incapable of acting on information they generate. It will usually require moving work from one person or department to another person or department.

Treat geographically dispersed resources as though they were centralized. The arguments regarding the benefit and tradeoffs of centralization versus decentralization are long standing in almost all organizations. Now databases, networks, and standardized systems allow for benefits of scale and coordination while maintaining the benefits of flexibility and service.

Link parallel activities rather than integrating their results. One kind of parallel processing is where separate units perform the same function. Another is where separate units perform different activities that must eventually come together. This principle suggests forging links and coordinating between parallel functions while in process rather than at completion.

Put the decision point where the work is performed and build control into the process. This contradicts a basic assumption of bureaucracy that people actually doing the work do not have the time nor inclination to monitor and control it and that they lack the ability to make decisions about it. If the doers become self-controlling and self-managing, hierarchy and the slowness and inflexibility associated with it begin to disappear.

Capture information once and at the source. Relational databases and networks make it relatively easy to collect, store, and transmit information today. This eliminates any need to live with delays, entry errors, and overhead associated with different individuals, departments or units repeatedly collecting the same information.[13]

> *Universities have stressed the training of critical intellect; they have neglected the training of imaginative intellect. In addition, universities in particular are said to be "loosely coupled" organizations. So the picture is one of confused, multiple-motivated people trying to advance loosely coupled institutions with bounded rationality while hoping to find ways to express themselves without sustaining any losses.*[14]

George Keller and Ann McCreery

SOME IDEAS ABOUT REENGINEERING A CAMPUS

As the 21st Century approaches, more and more is being written about the need for colleges and universities to develop a new paradigm to enable them to meet the challenges of our rapidly changing world. There are corresponding writings which make the point that productivity or "bottom line" in higher education is almost impossible to define,

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quantify or measure and that academic culture makes it exceedingly difficult to engage in enlightened management.[15,16,17]

Without describing the details of such discussions, it is the perspective of this paper that there are compelling factors that must be addressed by higher education. These include needs such as: (1) containing the growth of total expenditures and reducing certain costs, (2) further development of core competence throughout the whole organization, (3) an increase in the quality of instruction, research, and service provided, (4) a reduction in processing or response time of service functions to students, faculty, staff, alumni, or external groups, (5) an enhancement of the quality of worklife in the institution, and (6) the development of an organization that can learn from its own experiences and continually improve itself.[18]

Reengineering a complex organization such as a college or university is a major and serious undertaking. It requires tremendous effort that mandates change in many areas of the institution (an environment that likes neither mandates nor change!). Position descriptions, organizational structure, information systems, policy and procedure -- anything associated with the process of work -- must be examined and perhaps redesigned in an integrated way.[19]

The transformation of an institution will probably begin with a redefinition of prevailing organizational culture. Schein defines organizational culture as "the pattern of basic assumptions which a given group has invented, discovered, or developed in learning to cope with its problems of external adaptation and internal integration, which have worked well enough to be considered valid and, therefore, to be taught to new members as the correct way to perceive, think, and feel in relation to those problems."[20]

The predicted change is from a culture of professional management to one of entrepreneurialism. Comparison invites a long list of contrasts where movement from one culture to the other will include: external controls to internal controls; conformity to rules to creativity within bounds; central control to individual autonomy; rational/logical decision-making to intuitive decision-making; centralized systems to distributed networks; vertical hierarchies to horizontal networks; adult-child to adult-adult professional relationships; and organization centered to person centered focus.[21]

The organizational structure will also change. It will have fewer levels of management and fewer staff functions. The performance of work will revolve around small teams where the membership changes depending upon the project. The entire organization will become much more "customer centered." Information technology will be a facilitating and enabling force in the emergence of these new organizational forms.[22]

In many ways, colleges and universities may well have significant advantages over business and industry in reengineering. Elements of an entrepreneurial organizational culture are already in place in many institutions, particularly regarding academic personnel. The organizational structure, especially in large and/or research universities, may resemble the new order much more so than correspondingly complex business enterprises. Certainly the idea of creating a learning organization should not require a "hard sell" in a college or university. It is, however, important to reemphasize that despite advantages higher education might have, truly transforming a college or university will require significant

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commitment, consistency of action, and completely dedicated executive leadership with real vision.

Leadership is a key issue in reengineering. The traditional view of leaders is one of stereotyped *heroes*, special people who set the direction, make the key decisions, and energize the troops. They are great men and (occasionally) women who rise to the fore in times of crisis. Most may well agree that this perspective is a myth, but as long as such myths prevail, they reinforce a focus on short-term events and charismatic personalities rather than on systemic forces and collective learning.[23]

Leaders in a reengineering environment are responsible for building organizations where people are continually expanding their capabilities to shape their future. Such leaders are responsible for learning and must be designers, teachers, and stewards. These roles require different skills than are possessed by most charismatic heroes. The ability to build shared vision, to bring to the surface and challenge prevailing mental models, and to foster more systemic patterns of thinking is needed.[24]

Strong leadership is essential in transforming organizational culture. In a decentralized, structured organization (such as a university), standard operating procedures determine the allocation of attention of organizational participants unless the leader intervenes. Thus, one element of leadership is the effort to capture the attention focus of organizational members. Three mechanisms to help perform this function are: communication between leader and participants, role modeling, and reward systems. Belief in mission and an honest dedication to the people who must carry it out are crucial to good communication. Role modeling is another form of communication. Behavior exerts leadership whether the leader intends it or not. Rewards can be effectively used to reinforce the priority system for attention allocation.[25]

Measurement of what we do and periodic evaluation of goals and objectives are important now (although neglected) and will be even more so in a reengineered organization. Much current measurement reflects the form of existing position descriptions and the attitude of too many toward work, i.e., we measure whether or not, or how well we complete tasks. In the future, we must focus upon measuring desired outcomes--not tasks--and set up work expectations in the same way. Many colleges and universities do a good job in setting and evaluating goals and objectives. They are, however, almost always organization centered. Reengineered organizations will need to augment management by objectives with management by subjectives.

Management by subjectives (MBS) focuses upon optimizing human performance and requires managers to recognize, understand, and balance formal (organizational), informal (group), and personal (individual) processes. To be successful managers, will need to pay more attention to individual uniqueness, communicate well, and develop personal relationships based upon trust. Facilitating processes, both in small groups and with individuals, will be increasingly important. MBS suggests that: (1) the best way to "get to" someone is to create an environment where people, through communication, make themselves available to change; (2) the essence of communication is not clarity but trust; and (3) communicating well is when people like themselves in your presence.[26]

In a reengineered institution, information technology units will need to make the same kinds of shifts as outlined above but be one of the first units in the organization to do so.

Information technology leaders or chief information officers (CIOs) will need to exhibit leadership characteristics as described. Additionally, a significantly greater proportion of information technology managers will need to provide leadership both within the information technology unit and across the campus for transformation to be successful. As managers in all units assume greater information management responsibilities, information technology managers will more and more find themselves fulfilling roles of designers, teachers, and stewards and facilitating or coordinating across the campus and between units.

One of the basic assumptions underlying reengineering is that information technology planning will become an integral part of institutional strategic planning. CIOs will continue to coordinate campuswide information technology planning and have primary responsibility for information technology tactical and operational plans but the most senior institutional executives must move from being spectators to full participants in strategic information technology planning. They must engage in the process of creating opportunities to strategically apply information technology.[27]

Finally, information technology systems design must reflect the reengineered environment. This will occur in many ways and the following examples are illustrative rather than exhaustive. An open systems model is important as is widely communicated and agreed upon standards. The design must support broadbased access to all organizational levels and varied constituencies with either the need or the right to know. Integrated relational database management systems (that are truly distributed when possible) coupled with state-of-the-art development and inquiry tools will be a necessity. The fundamental design criteria must change from a basic focus on functionality for the primary user to recognize that the system must support the corporate executive user, the primary user, and the ultimate end user. This has ramifications for all levels of software, hardware, and networks.

> *Winston Churchill once said that "empires of the future are empires of the mind." Today that observation has come true. What has not yet been appreciated is the degree to which raw, elemental power—at the level of private life as well as at the level of empire—will be transformed in the decades ahead as a result of the new role of "mind."*[28]
>
> Alvin Toffler

CRITICAL SUCCESS FACTORS FOR REENGINEERING IN HIGHER EDUCATION

Colleges and universities are institutions of learning, and those in the United States are generally regarded as the best in the world.[29] However, the time has come when the question must be asked, are U.S. colleges and universities learning institutions? The transformed, reengineered or informated organization of the 21st Century will be a learning institution. One of the principal purposes of such organizations will be the expansion of knowledge. This will not be knowledge for its own sake, as in academic pursuit, rather knowledge that resides at the core of what it means to be productive in a global economy and world society. Learning can no longer be a separate activity that occurs before one enters the work place or later in classroom settings. It cannot be an activity preserved for managerial or elite technical groups. The behaviors that define learning and those that

define being productive have come to be one and the same. Learning does not require time out from productive activity, learning is the heart of productive activity. It is the new form of labor that is now building the "empires of the mind."[30]

How do colleges and universities become learning organizations? The following ideas are offered as further points of discussion regarding what it will take for campuses to be reengineered.

Have a recognition of the need for broadbased, institution wide change to achieve new levels of strategy, commitment, and service. It is believed that this is not a generally held perspective and that even where it is some "initiating spark" will probably be needed to overcome organizational entropy for any serious consideration to be given to reengineering. That spark might come from a crises, a new leader, or an external person or event.

Set forth a well articulated information strategy that is synergistic with institutional decision-making. This is not a glorified information systems plan! It is a strategic direction set forth by executive leadership that recognizes information as a critical resource. It requires access by all levels of the organization and the ability to use information immediately in decision-making as significant elements of providing acceptable service to constituents. Such a strategy would require the information technology plan to be integral to the institutional strategic plan.

Acquire a preexisting critical mass of innovative people and information technology. Rapid, major change with comfortable elements of the work environment is not easy for anyone yet reengineering requires exactly that. Thus innovative individuals capable of handling the change and helping others to do so must be in place during the transformation. An existing information technology infrastructure capable of supporting and sustaining the transformation is also necessary.

Have an information technology staff who see the vision and know that they must plow new ground. It is all too possible to have an IT infrastructure capable of supporting reengineering but not have IT leaders, managers, and technicians who can do so. "Pride of ownership," "This way has always worked," or "If it ain't broke don't fix it," attitudes simply will not mix with a transformation orientation. Information systems people must be in the forefront of any reengineering endeavor, and they must begin within their own unit.

Make a commitment to examine, reorient, and redesign -- without prejudice -- all policies, procedures, and position descriptions to emphasize outcomes. The magnitude of change discussed in the literature points to a complete overhaul of standard operating processes and allocation of attention by organization members to different things. Leadership intervention may cause a change of focus for a while, but permanent change to embrace the principles of a learning institution requires very different standard operating procedures.

Gain acceptance of a wholistic approach to resource allocation. The primary reason to engage in reengineering is to achieve productivity breakthroughs. Positioning an organization to enable transformation, however, will involve considerable time, energy, education, and expense. By and large, the expenditures will have to come from existing resources which means elimination of that which is unnecessary. The institutional focus must be upon mission and the long term good of the organization versus nonaligned unit goals and short term perspectives.

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Create an organizational structure that accommodates a learning institution. Metaphors such as a symphony, an adhocracy, a permeable membrane, a collapsed pyramid, and a spider's web have been used to describe structures that will replace bureaucracies.[31,32] Whatever descriptor prevails, the networked organization will have fewer levels, better communication channels, quicker decision-making mechanisms, an outcome orientation, and more flexibility. It will combine the benefits of both centralization and decentralization.

Design an entrepreneurial organizational culture. Basically this is a recognition that institutions of the future will produce, learn, communicate, innovate, and behave only as well as the sum of the organizational participants. An orientation on values and a focus on the importance of the person must be evident. Objectives of the organization, the group, and the individual must be better aligned and coordinated.

Emphasize different leadership characteristics. Vividly articulating a shared vision is crucial to reengineering. It is an ongoing process that requires leaders to continually share their own vision and ask, "Is it worthy of your commitment?" Although fear is a powerful short term motivator, aspiration must endure as the continuing source of learning and growth. The shared vision, therefore, needs to be powerfully positive. Balancing inquiry and advocacy are important skills for leaders of learning organizations; they need to do both well. Transformation leaders must be able to discern between espoused theory and the theory that individuals really put into practice, and they must be able to diffuse defensive routines. Leaders of the future must be able to see interrelationships and not focus on detail complexity. They must avoid symptomatic solutions and be able to move beyond blame. Finally, such skills must go beyond a few individuals at the top of the organization. They need to be distributed throughout.[33]

Reengineering requires "thinking big," extraordinary commitment, and absolute dedication to the accomplishment of organizational mission. It is not a consideration for the timid, but it may well be the path for maintaining the most successful system of higher education in the world.

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TRANSITION YEARS

FOR INFORMATION TECHNOLOGY---

PLANNING IN THE STRATEGIC DECADE

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This paper discusses the ways in which the 1990's represent a transition period for the role of information technology at institutions everywhere. Planning for the evolution and targeted applications of information technology that is truly strategic in scope is essential to success in the decade that bridges two centuries.

Specific points focus on the role of strategic planning in the 90's, the kind of planning required and why it is important. In addition, a discussion of who should be doing the planning and a suggested structure for the process will be highlighted.

Finally, a set of issues to be resolved, checkpoints to pass, and guiding strategic principles will be offered in a "where do we go from here" discussion.

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I believe that the role of Information Technology Strategic Planning is to help both the Information Technology Organization and the institution through these transition years. The transition that I believe we are involved in right now is the transition from our DP or "data processing" past to our personal productivity oriented future.

I read an article last week in the HARVARD BUSINESS REVIEW entitled "Crafting Strategy". It was written by Henry Minsberg who is a professor of management at McGill University , and I recommend it to you highly. One of the quotes from Minsberg in the article is that "strategy is both plans for the future and patterns from the past". I would like you to keep that in mind as we talk about strategic planning today because I think a lot of people have the idea that if you are doing strategic planning, it's totally future oriented - - it is all about the future. In fact, I believe it is as much about the past as is it about the future and we cannot forget some of the things we have learned over the last 20 or so years of information technology development.

I'll talk a bit about the role of strategic planning in the 90's, at least as I see it. I think first we have to understand how information technology planning has evolved over the past couple of decades. I think most of us have been involved in project planning and in some of the early days of BSP and the like. Today, when some people talk about strategic plans, unfortunately, they refer to no more than a collection of project plans laid out on an annual year-to-year basis. That is not the kind of planning that I want to talk about today, although that kind of practical, project planning is very important. I believe that it must come after the strategic part of your planning process. It is clear that strategic planning in the 90's has to be linked very tightly to the mission and purpose of the institution. Now for those institutions that already have a mission or purpose statement, that linkage may be easier. There are lots of institutions, however, who have no such statement, and in fact need one in order to be able to move ahead in the planning process. Part of the role in information technology is to help the institution with its own mission or purpose statement.

One of the things that I think are extremely important in the 90's, and we are building into our efforts at UC San Francisco, is the integration of our information technology planning with our long-range development planning. This signals to me a very strong commitment to the fact that there should be one long-range development plan for the campus which includes the plan for information technology support. In fact what we intend to do is to have our information technology strategic plan be a chapter in our long-range development plan for the campus. I recommend this approach for those of you who may be getting ready to do a strategic plan.

One analogy that helps me understand the role of strategic planning is to think of information technology as a lever - a very, very effective lever. The strategic planning provides the necessary fulcrum to achieve the leverage that we can provide to our institutions when the two work together.

I'll talk a bit about planning attributes. Some of these you have probably heard before. One that I feel very strongly about is that strategic planning is, in fact, a process. It is not an event. It is not something that ends up with a document and then you are done. It is something that goes on and on. Therefore, the planning document - your strategic plan - is a byproduct but it is not the product. The process is the product of strategic planning. One key attribute of strategic planning is that it does involve both top management and grass roots levels, if you will: folks out there in the schools and departments that are doing the real work. It needs to be guided from the top in that the executives on your campus need to "buy into" the vision that you establish for the future and make it their own, but you have to provide for local implementation because the real planning implementation work is going to be done at the school and department levels. The two of those together make for a successful strategic plan and planning process. Finally, it is very important that your planning process and your plan drive the budget process. There have been a lot of good plans developed in the past that came out after all the dollars had been allocated. It is important to complete the planning cycle as your budget cycle gets started so that you've got all your ducks lined up. It won't guarantee you will get all the dollars you want, but you will be in the best position to track those dollars early in the budget process.

There are some reasons, at least in my mind, why strategic planning is essential in this decade. One is that it does provide some common direction that allows for local initiative. I think the days of central planning all coming from the top are gone, and we have to provide for lots of local initiative, because that is where most of the good ideas are. Strategic planning does allow for large complex organizations to be able to move forward against some general goals and a vision of the future through local initiative. And finally, given the constrained resources that we have in our institutions the one thing that will get us through this next decade is information technology; but that alone without a strategic plan is going to be useless. So, I think that planning optimizes our ability to use the constrained resources that we have.

Who are the experts? Fundamentally, the planning process experts are those who are at the working level in central administration, in the schools, and in departments. The experts are not consultants whom you go out and hire, although you may need to do that. The experts are not the people who are sitting in the information technology organization nor are they the vice-chancellors or vice-presidents. The people who need to be engaged in the planning process - who I believe have the answers to where the institution needs to be headed - are the folks at the working level. The key in any planning process and in particular with strategic planning is the maximum involvement of staff, those staff who have a stake in the results. If you buy into the fact that the experts are all around us, you really do need a process and a structure to be able to hold concepts together and to keep everybody on the same page.

So I would like to move now into a very cursory overview of a kind of generic planning process. It is one that in fact we are using at UC San Francisco. It is working fine for us but it does not necessarily mean that it is the lock-step planning process that you need to adopt for your campus. Basically, there are several stages, the first involving development of a mission; a vision of where you see information technology and its role in your campus in the future; taking a look at some critical environmental factors that are going to impact the planning process; identifying a handful of strategic principles that can be helpful in choosing among competing priorities; developing your tactical alternatives and plans; and finally a monitoring and recycling process for the plan.

In the mission and vision phase, we look for a linkage to whatever is the mission of your institution. Then we determine what ought to be the mission of your information technology organization, and how that fits the mission of your institution. I will give you a sample of a mission statement which will illustrate that point. In the first phase you are really talking about getting organized; setting up a way in which you can explain the process to the folks who are both going to evaluate its success and who are going to participate in it. There was a large amount of time that we spent this past year just explaining what strategic planning was, how it was going to work, and people's role in that process. That is something that you are going to have to do yourself, because it has to be tied to your own institutional culture. The vision stage is projecting, what are the things that we want our institution to stand for in three to five years? What are to be the attributes of life at the university in that future time? A helpful way of doing that is to take a look at what are some of the attributes of your life today. When I say "your life" I mean, what are the typical things that either facilitate or get in the way of faculty members being able to do their research or faculty members being able to provide a good teaching environment, of students being able to have a good learning environment, of administrators being able to be effective in what they do. Then, project out five years to see if these are some things that, if they existed, are worth shooting for today. I will have some examples of that as well. The principal purpose of the mission and vision establishment phase is to establish a common set of information technology goals against which to measure progress.

I took my staff on a two-day retreat where we ran through a whole strategic planning process as a dry-run for the campus so we would have an opportunity to see how it worked. The mission statement that we came up with for our organization was: "To provide leadership in the use of information technology for the enhancement of personal effectiveness and the promotion of university excellence." You notice you do not find the word "computing" in there. Mission statements by themselves are not going to inspire anyone. They have to be linked to a vision and some strategic principles and the rest but are the place from which to begin the planning process.

When you get into the process of developing a vision of where you want to be three to five years out, you usually develop a list - a fairly long list - of attributes of the future. These are just some examples of some that we came up with:

1. Desktop work stations will cost less than $1,000.
2. There will be a common graphical user interface to all applications.
3. At least 50% of paper forms will be on-line.
4. Information technology will be less visible.

The important thing is that these are statements which are understood both inside and outside the information technology department.

Strategic principles come in several different forms. Some of you may be familiar with the concept of strategic frameworks. The issue is to translate this vision of the future into some hard-nose project plans. Strategic principles are key to this translation process, and I have some examples. Essentially, the principles provide a set of guidelines which can shape the action plans and link them back to the mission and vision. One test of a strategic principle is whether it can be useful at the departmental level in making local decisions that mesh with the overall campus direction. It provides a common point of departure for local planning. Finally, strategic principles establish a set of standards against which to evaluate your information technology investments or projects.

One example is a principle we talked about at Stanford eight or nine years ago. It is one that makes a lot of sense and I think is aspired to by many institutions: "All data should be collected once electronically as near as possible to its point of origin." If this principle is adopted from the top of the organization down, it has a very, very dramatic impact, for instance, on the kinds of administrative applications that you develop or purchase. As simple as it seems, it is a very powerful concept. Another is one that is particularly useful to us at UC San Francisco: "A uniform level of access to electronic data in quality and quantity will be available at all campus locations". Our institution is located everywhere. We have 110 different addresses in the city of San Francisco. We have people scattered all over the place and one of our biggest challenges (and this gets back to information technology being a part of your long-range development plans for the campus) over the next ten years is how do we provide a more or less equal working situation for all of our staff scattered all over the city. One way we can begin to do that is by establishing this principle in terms of electronic access. Obviously this has a lot to say about the kinds of networking strategy we have and our network topology and the like.

Another strategic principle example is "Information technology products should be measured by their benefits not their technical sophistication". At our institution, we

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do not have computer science department. We essentially have to borrow from things that are at the cutting edge or developed elsewhere. So one of the messages that I am trying to send my staff is "yes, of course, you are going to be evaluated on technical quality, but ultimately we are all going to be evaluated in the benefits that we provide through these applications not by the technical sophistication".

Just prior to moving to the tactical phase of your strategic planning process, it is wise to take a look at critical or environmental factors. This is the time in the process when you identify those things that might affect plan development and implementation. These things can be organizational, they can be political, they can relate to user mix, they can relate to resources. At our particular campus, an organizational one, and partly a political one, we have listed as a critical factor is that the top administrator on the campus, the chancellor, will be gone within two years. He is going to retire. We cannot control the outcome of that, but we should be aware of it. We should not tie our plan to our chancellor personally, because he is going to be out of the picture. So we need to be aware of a planning process that takes these kinds of factors into account.

The next phase is the phase where we used to start planning, ten years ago. We started saying "Okay, we have got so much money" or "We don't know how much money we have got". "We have got these projects out there, I guess we had better line them up and develop project plans for them". The difference between that kind of planning and what I am talking about is the action planning being preceded by the development of a strategic context in which action planning can be placed making it easier to chose among competing alternatives. At my institution (and I am sure we are not unique), up until recently winners among competing alternatives were chosen based on who screamed the loudest, or what school a particular person represented. If you were from School A, you got what you wanted. If you were from School B, you did not get anything. A public strategic planning process like the one I am trying to describe here, allows for the projects to be selected in an environment that is much more open and much more has everyone on the same page. In the tactical alternative stage, we are identifying alternatives to achieving the vision, using the strategic principles as a backdrop or a set of standards against which to measure some of those alternatives.

Once again I will make the point about tactical plans needing to coincide with the regular campus budget process. One of the things that we are working on now is the completion of our first year strategic and tactical plan in time for our budget process which starts in late January. I wish we had more time to do this but since it is a process and not an event, I know that we will fix some things next year when we go through our second iteration.

The last point, is to build in "public" PERT charts. What I mean by this is a charted set of internal technical deliverables expressed externally in terms of the

campus' strategic plans - a set of milestones and deliverables that make sense at the departmental level, in the chancellor's office, and in the accounting office. Thus, everyone becomes a part of and can understand and measure our progress. That puts more "heat" on us in some ways but in the long run everybody is at least there with you for the successes and better understands the failures.

I think we have all begun to see that the applications that we either build or buy or the projects that we are involved in, in the 90's are not going to have a single client and many times are going to have the whole campus as a client. So, it is important that your regular progress report go to all of those who have a stake in the outcome.

On the plane on the way out I had the occasion to look at an excellent article by the CIO for Levy Strauss. His name is Bill Eaton and he talks about four challenges the CIO needs to focus on and work with others to achieve over the next several years. This applies not only to CIO's, but to all of us who are professionals in the field. His challenges are ones you might expect. His first one is getting the information technology platform ready for the future. This includes systems architecture - - traditional CIO material. The second is getting business processes ready to take advantage of the information technology platform (getting back to fulcrum and lever analogy). Thirdly, he says getting the organizational structure ready for changes in the way people work. Finally, there's getting people ready for the future, not just information technology people, but all the people; not just technically ready, but physically, ethically, and emotionally ready. I think some of us would say that is a fairly broad charter for the information technology organization but I think there is a lot of truth in what he says in terms of much of what we do in which we will take a proactive role. Strategic planning is going to relate to things far beyond the technology itself. It will determine what role do we play in the way people organize and do their work.

Where do we go from here? I think part of it is that we need to establish partnerships and I don't mean "making friends" with the users. I am talking about establishing strategic partnerships all around the institution and strategic partnerships outside the institutions with vendors and with other institutions. On our own campus, I think that the strategic planning process we have started has identified a whole set of new partners that we in the IT organization would never have thought of linking up with before.

I think the planning process that I have laid out here builds the kind of framework that we are going to need to get through this transition decade. Identify local models that are working and adopt them. There are a whole lot of good things going on right under our noses. I know that almost every week I find two or three things that are happening on my campus that I did not know about before that relate to things my organization should be doing. So one of the things that we have done

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in our strategic planning process is to solicit from folks on the campus the good ideas that are already out there.

Another quote from Minsberg is that "strategies need not be deliberate, they can also emerge". We don't have to think that we are guiding this fine-tuned machine and we cannot veer from the course. I think we have to realize that we do need some guidance and direction from central administration but we have to allow a lot of those strategies to emerge. I think there are things that people call strategies now which in fact are really just their recognizing things that have happened over the past three to four years which never started out as a strategy. This relates to the earlier quote of remembering the past because there is much we have already done which will help us through this next decade.

I had occasion to go to the Snowmass Conference in August and I was impressed by a talk given by Milton Glick, Provost at Iowa State. Dr. Glick said that the "bleeding edge is not necessarily the cutting edge, it is the result of the pruning of the trailing edge". I think there is something here in terms of strategic planning. Hopefully, strategic planning is the key tool to help us protect against pruning the cutting edges as well.

Thank you very much.

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BUILD OR BUY DECISION VARIABLES --PERSPECTIVES FROM THREE INSTITUTIONS

PROLOGUE

WHAT ARE SOME OPTIONS

THE PENN STATE EXPERIENCE

THE SOUTH DAKOTA EXPERIENCE

THE CARNEGIE MELLON EXPERIENCE

"BUILD OR BUY" CHECKLIST

EPILOGUE

Presented by

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CAUSE '90--November 29, 1990--Miami Beach, Florida

PROLOGUE

In the mid-1970's, David B. Tyack wrote a "History of American Urban Education" in his Harvard University Press book entitled *The One Best System.* The book is "an interpretive history of the organizational revolution...in American schooling." The title countersinks one of the themes i.e. the search for and the definition of "the one best system," in this case the one best system of education. The "system," if you will, is different depending on your view and your role in it. Tyack uses "the swing in the tree model" to show the different views of the system and the various interpretations based on those views. Tyack's model of the differing system views should not be lost in the interpretation and understanding of decisions taken and decision variables utilized in the definition and selection of the right software to satisfy institutional needs.

Tyack's participants in system definition, design, and installation are: teachers, principals, "central office," the board of education, the maintenance department, and the students. Tyack maintains that in education, "the search for the one best system has ill-served the pluralistic character of American society." While the character of University administration and management may not be as pluralistic as American society as a whole, its goals, objectives, understanding of needs and evaluation of alternative solutions to problems are likely, far from singular.

When Universities attempt to define information and data system problems and to specify solutions to those problems, just as with education, many participants become involved. The participants each have their own view and role related to these systems: Students, faculty, administrators, executives, Boards, and staff personnel. Over the past 20 years, the data processing specialist has emerged as a serious and equal participant with her(his) own view and role of "the system."

Part of what dictates a particular solution to a given problem arises out of the different roles and views. Many of the deciding factors or decision variables exist because of these differences in role and view. In the three institutional examples in this paper, each participant or homogeneous group of participants are shown to contribute in unique ways to the decision and to the "deciding factors."

In all three cases, the students and to a lesser degree the faculty have been isolated from the problem definition and even from the analysis of solution alternatives. The primary participants in all three cases were: academic administrators, executives, staff personnel, and the data processing specialist. In one case, South Dakota, the Board of Regents also played a key participatory role and had definite views about the system it would ultimately fund.

The decision to build or buy, then, is tempered and influenced by the view and role of each of the participants. Without attribution of blame or credit, suffice to imply that the participants arrive at their respective decisions based on the role they are asked to play in the decision and the views they embrace based on previous encounters of a similar kind. The options in selection of software to help run and operate the institution are not infinite. The options are relatively few; so what are some of those options?

WHAT ARE SOME OPTIONS?

The three institutional cases presented in this paper represent many of the possible build or buy options available to institutions. These options represent real alternatives which should, at minimum, be acknowledged by any institution contemplating implementation of new or replacement application software. Table 1 summarizes different options available.

TABLE 1
OPTIONS (AVAILABLE) FOR IMPLEMENTATION OF APPLICATION SOFTWARE

Build Options	Buy Options
•Use 100% in-house staff (management and technical)	•Install "Vanilla"; change internal procedures and policies to match software
•Use contract programming with in-house management	•Install "Vanilla"; institution modifies to match needs
•Use contract management with in-house programming	•Install "Vanilla"; vendor modifies to match needs
•Use 100% contract staff (management and technical)	•Contract for customization before installation
	•Contract for source code access to perform customization under contract with vendor or by institution

THE PENNSYLVANIA STATE UNIVERSITY EXPERIENCE (PSU)

History of Systems Activities (Pre-1980)
In the late 1960's a forward-thinking president, Dr. Eric Walker, foresaw the need for integrated data and information and encouraged the formation of an organization called Management Information Systems. The MIS group developed system requirements and built some applications which increased the efficiency of student registration and grade processing. That the initial vision of a large integrated database, however,was not supported by existing technology, and efforts to create such a system.

The vision persisted. As mainframe, programming language and storage technologies improved during the 1970s the potential for integrated databases and applications reappeared. In 1979 a task force of seven senior technologists drawn from various units throughout the University were brought together and charged to:

- evaluate existing data systems, and
- recommend steps to migrate to the next levels of information technology needed to support the institution in the 1980s and beyond.

The group recommended that the University define and build a set of integrated administrative information systems, with initial implementation efforts focused on a new student information system. The group also suggested that the University contract with an outside vendor to complete the defined tasks.

The Role and Importance of the Request for Proposal.
A Request for Proposal (RFP) was written and distributed to vendors during 1981. It served several purposes. The RFP:

- articulated the need for administrative units to support an environment in which consistently defined, collected, stored and retrieved data and information are shared.
- clearly defined the expectations of the University with regard to vendor inquiries, responses and qualifications, as well as the legal rights and responsibilities of both the University and the vendors.
- permitted vendors to bid on hardware, software, or both.
- stated general requirements for software systems.
- identified hardware requirements.
- required that the following major systems were to be defined by the vendor: Student, Facilities/Property Inventory, Financial, Human Resources, Budget Operation and Planning, and Business.
- required that the student system was to be designed developed and implemented by the winning software system vendor.

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The EDS Student System Decision - 1981
Proposals were submitted by twenty-two vendors. Electronic Data Systems (EDS) Corporation of Dallas, Texas, won the software systems contract. EDS did not have off-the-shelf software to meet the University's requirements, and proposed to design, build and implement a Student system. EDS also proposed the design the other five major systems using the data flow diagram approach defined by Yourdon. The University decided to provide the hardware system using internal resources.

The Database Management System - 1981
A joint EDS-University team was formed to select the database management system, the teleprocessing system and the application software to be used in the development and implementation of the Student system. The team selected ADABAS, COM-PLETE and the fourth generation programming language NATURAL developed and marketed by Software AG, Inc.

The Evaluation of the EDS System - 1990
EDS turned over their final Student system products during 1985. The system which they turned over featured many on-line screens and many batch procedures. There is some real difficulty in looking at today's system and relating it to the EDS products. Many of the EDS products were functionally inadequate. An in-house staff of twenty-four analysts and programmers worked for three years after EDS departed to bring the products up to an acceptable level of performance and utility. Additional functions beyond the EDS products have been added, including a transcript system and a degree audit system. New technology such as voice response capabilities are now playing a major role in the processing of student registration and drop/add data. Those technologies were not required of nor included in the EDS development. The student system is no longer an EDS product. But that position does not minimize the significant contribution which EDS made to Penn State. Looking back on the decision to proceed with the EDS contract there were many positive benefits gained by that decision.

- The decision to hire an outside contractor established the necessary resources to launch the University into the on-line database era. Their presence within the University forced central offices and end users to realize that they had to be intensely involved with system design, testing and implementation.
- The fact that the vendor was working on a tight time-line required active University commitment of resources when the vendor needed them. No unnecessary delays could be tolerated on the part of the University because ". . . the meter was running".
- The vendor brought expertise in state-of-the-art systems definition and design methodology which was not available within the University.
- EDS and the University's senior technologists jointly established an expectation that data would be available to end users for ad hoc analysis and reporting. The environment for data administration was successfully established as a result.

Other factors which affected the pace and direction of the contract included the following:

- EDS had no previous experience in developing systems for higher education. They envisioned the Penn State contract as the first of many in higher education, and assumed that some of the products developed for Penn State would be transferable to other institutions. In effect the University was a complex training ground for EDS staff to learn about higher education while they were analyzing and developing systems to support the environment.
- The University had no previous experience with the level of system effort being undertaken, and did not realize the commitment of *senior* resources needed to interact with the vendor.
- The University needed to learn "on the fly" how to manage the process. Staff networks were needed to establish security access for users of the new Student system. Other University departmental resources were assigned to act as trainers in the "train-the-trainer" environment.
- Training users of the system was made difficult because vendor resources were very limited to support the on-going training needs as new products were developed and

released. EDS provided systems development personnel, not professional trainers or instructional development personnel.

- EDS underestimated the resource requirements.
- EDS had no prior experience using the ADABAS database management software and the NATURAL programming language selected by the joint EDS-University team.

The University received most of the basic modules of the student system which had been promised; the EDS product gave the University a base on which to add and to enhance.

The Integrated Business Information System (IBIS) Decision - 1987
Following the Student System development experience the University evaluated the EDS process and products and determined that sufficient expertise regarding the system development and implementation process existed so that the University should proceed with the development of IBIS using internal resources. It was decided that resources would come from many central administrative organizations, not just central data processing. Thus IBIS development began with staff from many offices all ready supporting the business functions of the University. Leadership drawn from user organizations was assigned to manage priority setting, and play a significant role in assuring that sufficient resources were available to keep the project moving forward successfully and on schedule.

Comparison of the Two Approaches
The two approaches can be compared only when the environment, and staff knowledge and experience at the time of the decision are carefully taken into account.
The decision to go with an outside vendor was based on several factors which applied in 1980:

- University technical staff were heavily enmeshed in the maintenance of existing systems, and organizing a critical mass of staff to complete such a major undertaking was deemed impractical.
- University administration had recognized that much improved information systems were needed for the University to be successful in the 1980's and beyond, and were willing to commit financial resources to make that happen over a relatively short time horizon;
- University staff had limited knowledge at best of new analytical techniques which could be ffective in the major systems development environment being envisioned;
- University staff had limited knowledge about the development of on-line systems in the relational database environment, but were willing to learn by working side by side with a vendor who could apply those techniques.

By 1987 much of the technical data processing environment of the University had undergone the changes envisioned in 1980. The following factors led to the decision to develop the remaining systems in-house:

- University staff had acquired significant expertise in the development of products for the on-line environment;
- User offices were committed to the concept that they had a significant role to play in defining system functionality and in cooperatively developing and implementing applications critical to operations and planning within the University;
- There was a feeling of commitment which said to the University community that existing staff were up to the task ahead, and that those staff, because of their in depth knowledge of University environment and functions, could do a better job than an outside contractor.
- There was a realization that the system development effort would require the assignment of significant numbers of University resources, even if an outside contractor was brought in to do the job.
- It was felt that in-house staff could improve significantly on training previously provided because of their understanding of the operational and planning processes used within the University.

Decision Variables Important to the Selected Approach
The above comments can be condensed into the identification of the following variables which appear critical to any decision on "buy versus build":

- The current workload of existing staff with regard to maintenance of existing systems;
- Staff knowledge with regard to analytical techniques used to define the functionality of a system;
- the commitment of the institution to funding a vendor effort versus an in-house effort;
- The availability of a vendor-supplied software package which could meet the majority of the institution's needs without needing overwhelming enhancements or modifications (significant enhancement could equate to little or no vendor maintenance of the operational system);
- The availability of a vendor package which could run on the existing hardware and database platform, and using application software which existing staff were familiar.
- The availability of management expertise within the institution to control development and implementation in either the vendor or in-house environment.

THE SOUTH DAKOTA UNIVERSITIES EXPERIENCE

History (Pre-1984)

There are six public institutions under the control of the South Dakota Board of Regents: Black Hills State University (BHSU), Dakota State University (DSU), Northern State University (NSU), South Dakota School of Mines and Technology (SDSMT), South Dakota State University (SDSU), and the University of South Dakota (USD). These Universities operate autonomous academic programs and each has their own president and administrative staff. The institutions are all located near the states bordering South Dakota.

Prior to 1984 each of the institutions maintained and operated separate, distinct administrative data systems. There were three mainframe computers being used in support of these systems. SDMT utilized a CDC Cyber system, SDSU operated an IBM 370 class mainframe (3031) and another IBM 370 class mainframe (3033) was located at USD. BHSU, NSU, and DSU utilized the 3033 located at USD through remote job entry stations. Each of these institutions wrote and maintained their own applications even though they shared a common hardware resource. The one exception was payroll processing. The payroll system which was utilized by USD, BHSU, NSU, and DSU was maintained by USD staff. The production was run by each of the institutions.

The shared facility at USD was referred to as the Higher Education Computing System (HECS). The HECS facility was managed by the USD computing center staff. There was not a *separately*, defined (or budgeted) HECS and USD Staff. There was however, a separate budget which was used for HECS hardware and system software acquisitions.

The Role and Importance of the RFP Process

In 1984 the South Dakota (Higher Education) Board of Regents mandated that the six institutions move to a centralized on-line registration and student information system. The goal of the Board was to have more centralized and standardized reporting capabilities in terms of data and format. Several of the institutions had developed their own on-line registration systems but registration was still a batch process at a few of the institutions. A state-wide task force was formed and charged with producing a functional requirements document for the system. This task force had representation from each of the six institutions involving a large number of people who contributed to the creation of and official Board (document describing and delineative the requirements.

The requirements document was submitted to many commercial vendors for proposals and responses. Several vendors made presentations to the task force. Existing systems at several of the S.D. institutions as well as a couple of other institutions were also evaluated against the functional requirements. The possibility of "in-house" development of the new student system was also evaluated; there was not a central information systems staff in place at that time. The effort required to assemble a staff and build the application from scratch was considered too vast for serious consideration. The effort could not be completed within the prescribed time frame. The Board was anxious to replace the existing, disparate systems and wanted a solution within 2 - 3 years.

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Evaluation of SIS Decision
The number of vendors in contention was reduced to two . . . Information Associates and SCT. Detailed proposals for systems which would meet Board requirements were solicited from the vendors. Both proposals required a significant amount of modifications to handle multiple institutions and to meet other specific S.D. requirements. After extensive, competitive evaluation the task force recommended the purchase of the SCT ISIS system. Even though South Dakota state law did not require a formal bidding process for the procurement of software and services bids were extremely cost-competitive. The final decision was preceded by software testing, technical demonstrations and an intense review of the finalists, business qualifications.

The decision to purchase the SCT system rather than build a system from scratch still appears to have been the correct decision. The system is up and in production. Like all implementations there have been problems along the way and there is still a list of outstanding requests. The political environment was one in which it was much easier to obtain funding to purchase software and services than it was to obtain the same amount of funding for the staff necessary to undertake the writing of a system of this magnitude. Furthermore, a development project of the perceived magnitude and size had never been successfully undertaken in South Dakota at that time.

Payroll/Personnel Decision
The Board of Regents also decided that the institutions should be using a common payroll/personnel system. There was considerable political pressure for the institutions to "join" the state government payroll system. The State of South Dakota system did not provide all of the necessary functionality required by higher education. Vendor systems were evaluated during this process. There were no vendor products available which supported multiple institutions *and* provided the required functionality. There was a central HECS staff at this time and a product existed that was already being used by four of the six institutions. The product provided a substantial beginning compared to building a system from scratch.

The decision was made to use the "PayPerS" system and make the modifications necessary to support the two additional institutions. The changes necessary to support the other institutions were identified and the modifications made to the system by the HECS staff. A state-wide task force was once again formed with representation from each institution. This task force identified system functionality and recommended priorities for system enhancements and modifications. There was very little incremental cost involved in this approach. The base software already existed and the modifications were relatively minor.

Comparison of the Two Approaches
The two approaches both have worked fairly well. The alternatives, however, were very different in the two situations; for example:

- There was no common applications platform at the six institutions to use as a starting point for the SIS but one did exist for the Payroll system.
- There was a much greater difference among the institutions in operations, procedures and requirements for the SIS than for the payroll (PAYPERS) system.
- The modifications to the SIS were performed by the vendor. The cost of the modifications exceeded the cost of the license for the base product; fewer modifications to the PAYPERS were required.
- There was an applications development staff available to perform the modifications to the PAYPERS system; staff was not available at the time the SIS decision was made.
- Even though the South Dakota higher education funding was austere, it was much easier (in a relative sense) to obtain software funding than to hire new personnel.

THE CARNEGIE MELLON UNIVERSITY (CMU) EXPERIENCE

History of Administrative Information Systems (1986-1987)
The opportunity to implement a new generation of administrative information and management support systems was made possible in 1987 by the allocation of permanent University funds for this express purpose. The

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confluence of recognition of need by the senior officers of the University and the opportunities provided by the current and near future technologies have provided the new model for the acquisition and processing of data and its transformation into useful business information and intelligence.

The systems development leverage provided by the merging of relational data base systems with open systems architecture will negate the need to reprogram when new hardware or operating systems are dictated. The long term financial and operational advantage of application tenure cannot be overstated. Current indications are that many application software vendors agree and are planning or are creating more portable applications. In 1986 when the Carnegie Mellon Administrative Systems strategy and technological vision was articulated, few applications vendors had yet seriously acknowledged products based on either relational or open (systems) hardware and operating system platforms. Carnegie Mellon did seek out and find a few vendors who were willing to experiment with relational applications. Technology opportunities have dictated the course of administrative systems development in equal partnership with the changing demands of both the central and non-central offices of the University.

The Role and Importance of the Requirements Process

In anticipation of the removal of the DEC-20 computing environment, two major administrative systems development projects were authorized in 1986. These two projects were:

- *Student Information Systems (SIS)* consisting of new applications software to serve the functions of admissions, student record-keeping and registration, financial aid, student accounts receivable, student housing, and dining services.
- *Human Resource Information Systems (HRIS)* consisting of new applications software to serve the functions of personnel and benefit administration, payroll, wage and salary administration and manpower planning and budgeting.

While the Administrative Systems department was responsible for the development or installation and implementation of each of these applications, the system requirements and the selection from design alternatives were the responsibility of a broad base of administrative and academic offices. The process of requirement definition, planning, review of policy issues, establishment of project time tables and identification of costs associated with these projects began with the creation of a three-tiered organizational structure. The structure provided for:

- *an Executive Steering Committee (ESC)* whose general responsibilities are to provide University policy guidance and resolution, approve cost proposals and resource commitments, negotiate contracts with outside vendors, review project plans, monitor progress and approve "build or buy" decisions.
- *two Planning Task Forces (PTF),* one for HRIS and one foe SIS, whose responsibilities were to develop the project implementation plan, set timetables for completion, select software, recommend to build or buy applications software, monitor implementation progress, develop cost proposals and develop system design specifications.
- *two Implemention Task Forces (ITF),* one for HRIS and one for SIS, whose responsibilities were to install and/or develop application software, write or rewrite system and procedure documentation, design forms, provide detailed design and/or modification specifications, effect modification, write any new application code, test programs, modules, and systems, convert necessary input files, monitors tests and conducts any parallel (old system and new system) runs.

These three organizations drew upon personnel resources from many departments were completely responsible for all phases of the systems development process. The two planning task forces with assistance from a consultant developed the functional requirements against which the "Build or Buy" decisions were evaluated. Vendors were contacted for interest and qualification assessment; there was no formal request-for-proposal developed. Each vendor reviewed their products with the PTF and in most cases provided at least minimal product demonstration. The single most important result of the requirements process was the opportunity for each "participant" to share their view of the desired system with all other participants.

The Database Management Decision - 1986

While some Universities moved to data base applications in the late 60's and early to mid-70's, Carnegie Mellon chose to develop applications where programs and data were inextricable intertwined and file and data structures were relatively straightforward. The efficiency of relational technology in intense transaction-oriented applications was somewhat suspect. With the rapidly decreasing price-to-performance of processors and memory, inefficiency appeared to be less of a concern. Carnegie Mellon with the assistance of IBM, DEC and RTI (INGRES Corporation) conducted extensive benchmarks of the INGRES DBMS; the results were extremely favorable.

The decision to select INGRES was strategic in that (the decision) would seriously affect the future of administrative applications and the hardware platforms on which those applications would operate. There were no vendor supplied INGRES based applications available for higher education in 1986. Therefore, a decision to implement new applications using INGRES as the RDBMS was a de facto decision to develop many new systems in-house. The timeframe constraints on the other hand dictated that some software would need to be purchased and only a portion of the applications would be built "in-house" from design to implementation to use.

The SIS, HRIS and Alumni Information System Decisions

By executive mandate, all existing administrative applications were to be moved from the existing DEC-20 by December 31, 1988. This movement was to be accomplished by:

- *conversion* of non-integrated administrative DEC-20 applications to the microcomputer regime both stand-alone and networked.
- *conversion* of some applications to the VAX-VMS regime such as the University's financial accounting system (General Ledger and Accounts Payable). The planning for this move was begun in 1986; the move would take place after the 1987-88 fiscal year end closing (circa August, 1988).
- *replacement* of the key, major applications through both joint development partnerships and in-house development. Implementation of a student aid management system in partnership with SIGMA Corporation was undertaken and implemented in February, 1988 on the VAX 8700. Other applications identified for replacement were: Student Records System, Human Resource System (Payroll and Personnel) and Student Account Receivable. Two other major systems slated forreplacement at that time were: Alumni/Development and Admissions.
- *joint definition and articulation of information systems requirements* by central and non-central offices. Key departments work closely with the Administrative Systems department to ensure that proposed replacement systems meet non-central as well as central data and information system needs. The result of the implementation of administrative systems was to provide the basis for distributed data bases as well as distribution of processing and computing.

Evaluation of the Decisions - 1990

First, what were the decisions? CMU decided to replace all of its administrative applications either by conversion (to another operating system/hardware platform) with minimal enhancement or by developing new applications to replace old systems or by buying software from vendors willing to consider minimal pricing in return for a resultant product which would interface with the INGRES relational data base. The compelling forces leading up to these decisions were:

- Elimination of the existing hardware platform.
- Austere funding strategy given the scope of the replacement requirements.
- Minimum time frame to complete replacement of all applications.
- Desire by key administrative users to enhance rather than simply replace applications
- Migration to more portable, platform-independent applications.

Table 2 outlines the selected implementation strategy for each (major) application that has been replaced and also shows estimates of resources consumed by each of the applications. Table 3 assesses the decisions

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which were taken based on a retrospective (1987) assessment and a 1990 assessment of the 1986-87 decisions.

From these two tables one could conclude the following:

- The cost differential in personnel resources between "build and "buy" has been minimal.
- The cost differential swings both ways.
- There is less dissidence between user expectation and user satisfaction for smaller systems.
- The more involved the users are in the "build" or "buy" decision, the more likely the user will be favorably disposed toward the decision--whatever it is.
- The converse is also true; i.e. the less the users are involved the less supportive they will be.

TABLE 2
IMPLEMENTATION STRATEGY, BY APPLICATION

Application	Implementation	Staff Effort (person/yrs.)
1. General/Ledger/Accounts Payable (GL/AP)	Conversion	1.5
2. Payroll/Personnel (HRIS)	Buy/Modify Software	3.0
	Develop InHouse	6.0
3. Student Records (SIS) (including Student Accounts Receivable)	Develop InHouse	8.0
4. Admissions (SIS)	Develop InHouse	5.0
5. Financial Aid (SAMS)	Buy/Modify	3.0
6. Alumni System (AIS)	Buy/Modify	8.0
7. Property Management/Fixed Asset (PMIS)	Develop InHouse	2.0
8. University Information System (UIS)	Develop InHouse	5.0
9. Career Services and Placement (CSP)	Develop InHouse	2.0
10. Applicant Tracking System (CMARS)	Develop InHouse	1.0
11. Financial Resource Information System (FRIS)	Develop InHouse	1.0
12. Degree Audit (AA)	Buy/Modify Software	0.5
13. Room Scheduling (S-25)	Buy/Modify Software	1.0

TABLE 3
ASSESSMENT OF SELECTED "BUILD OR BUY" DECISIONS
(BASED ON PROBABLE USER: VIEW)

Application (Decision)	1987 Assessment	1990 Assessment
1. GL/AP (convert)	1	3
2. HRIS (buy/build)	1/1	2/1
3. SIS--Student Records (build)	1	1
4. SIS--Admissions (build)	1	1
5. SAMS (buy)	3	2
6. AIS (buy)	1	3
7. PMIS (build)	2	1
8. UIS (build)	3	1
9. CSP (build)	3	1
10. CMARS (build)	1	1
11. FRIS (build)	3	1
12. AA (buy)	1	1
13. S-25 (buy)	1	1

LEGEND: 1 = GOOD DECISION; 2 = BAD DECISION; 3 =TOSS-UP

BUILD OR BUY CHECKLIST

The three cases exhibit many of the same properties critical to the decision to buy or build. While of the decision variables on this checklist apply to all three institutional settings some applied more specifically to 1 or 2 of the settings.

- The (current) workload of data processing staff with regard to maintenance of existing systems.---(All)
- Staff knowledge with regard to analytical techniques used to define the functionality of a system.---(All)
- The willingness of the institution to funding a vendor effort versus an in-house effort.---(All)
- The availability of a vendor-supplied software package which could meet the majority of the institution's needs without needing overwhelming enhancements or modifications.---(All)
- The availability of a vendor package which could run on the existing hardware and database platform, and using application software with which existing staff were familiar.---(PSU and SDU)
- The availability of project management expertise within the institution to control development and implementation in either the vendor or in-house environment.---(All)
- Availability of multiple viable vendor alternatives which fit the hardware and software environment.---(All)
- Availability of data processing staff resources for development in-house.---(All)

- Cost of software plus cost of vendor-supplied modifications vs. cost of personnel to design, develop, test, install and place in production the functionally correct software.---(SDU)
- Acquisition policy and funding philosophy for each institution or system of institutions i.e. additional resources for people, software or vendor-supplied personnel? Which is more viable in your environment?---(SDU and CMU)
- Access to and availability of technical staff to develop new applications---(All)
- Portability of Applications to Future Hardware and Operating Systems.---(CMU)
- State-of-the-Market-Technology.---(All)
- Vision from the top of the Organization---(All)

EPILOGUE

The three institutional examples of decisions considered and decisions taken exhibit similar decision variables. This is, to us a least, very surprising, given the extremely different cultural and governance differences. Penn State on the one hand operates 22 campuses as a very large, state land grant institution in a rural setting under strong central office control. South Dakota's state supported universities are wide-spread across a state covering 75% more land area than Pennsylvania which operate six autonomous academic programs under strong central oversight from the Board of Regents. Carnegie Mellon is a small private, urban research University which operates with only modest goverance from its Board of Trustees and has seven academic schools within its purview, all quite autonomous academically.

And yet, the decision to "build or buy" in each instance seems inextricably intertwined with a very similar set of decision variables across the three cases. On the other hand, the decisions taken are not only different across these institutions but different from application to application. The answer is clear. There is no one best answer, at all times, for all time, in all places. The answer is -- It all depends ! ! "
The "answers" seem to depend on:

- the users' views of "the system"
- the users" role in selecting "the system"
- the credibility of the:
  - in-house developers
  - available vendors
- the match between vendor software and campus technology vision
- the enhancement requirements of vendor software
- involvement of executive decision-makers (this one is tried and true)
- funding policy limitations

The "answers" seem to depend less on:

- the initial perceptions of software requirements vs. software availability.
- the total cost of either implementation.
- what vendors say their software can do and more, the actual performance
- the initial investment cost of the either.

Bootstrapping a Small Campus into the Electronic Age

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A fifteen hundred student campus has launched a process to bring itself from a state of almost no use of technology to a respectable level within a six year period. The process has included introspection, external review and U. S. Dept. of Education Title III funding. Careful attention has been given to faculty development, planning, and organizational structure. The technology includes Local Area Networking, distance education through interactive television, library automation, interactive video and traditional audio-visual.

The presentation will cover strategic planning, current status and future expectations.

In this paper we give a thumb-nail description of the University of Maine at Presque Isle, a brief history of technological events through fall of 1988, a statement of the crisis at that point and the steps taken from that point to resolve the situation and propel progress.

I. Description of The University of Maine at Presque Isle

The University of Maine at Presque Isle (UMPI) is the fourth largest of seven campuses of the University of Maine System. It has evolved from a Normal School and Teachers College and in 1969 assumed its place in the new University of Maine System. Within a few years it increased its size of student body and faculty, and diversified its offerings. Its strongest programs today are in elementary and secondary teacher education, business, social science, physical education and recreation. There are also several modest liberal arts programs. Approximately sixty-five full time faculty over four divisions together with thirty-five part-time faculty serve programs on campus and at off campus centers located at Loring Air Force Base (LAFB) and the town of Houlton ME, 20 and 40 miles respectively from Presque Isle. The three dormitories on campus hold four-hundred students. The full time equivalent enrollment is 1000, with approximately half of all students over age 24 or having children of their own.

II. History of Technological Events through Fall 1988

This history is characterized by erratic resources, and subsequent chaotic development.

Academic computing has evolved from the installation in 1969 of one IBM 2741 terminal to the main-frame in Orono 150 miles to the south and then another in 1972. In 1981 four Apple II+ microcomputers were bought, and in 1982 a one-quarter time Coordinator of Academic Computing Services (ACS) was appointed from the faculty. By 1984 the four Apples had become eight and a third terminal to the main-frame was added.

In early 1984 a first Five Year Plan for ACS was drawn up by the quarter-time ACS Coordinator. At that time, no networking was considered, and a steady acquisition of microcomputers and terminals was anticipated. Envisioned were limited dormitory access to microcomputers and the University System supported mainframe computer in Orono called CAPS (Computing And data Processing Services), a manual software check-out system, a shared microcomputer in each faculty office complex (each serving approx five faculty), an expanded open computer lab, a closed computer lab for ongoing faculty and student projects, a computer for each instructional laboratory (e.g. chemistry, physics, biology physiology) and provision for several classrooms equipped for group viewing of a computer monitor. A goal was set to have one accessible computer keyboard per four faculty and one per 25

students. It was anticipated that the computer coordinator would become at least one-half time and that half-time clerical support would be sufficient. All on-site maintenance would be performed by the ACS Coordinator.

In late 1984 a bond issue was passed by the public in the state which included a large component for upgrading technology, and in particular networking as it was then conceived. Using this funding, by early 1986 an AT&T Integrated Systems Network (ISN) was installed on campus. This is a telephone style packet switch which handles data at serial speed. The ISN provided access to local minicomputers, the CAPS mainframe including E-mail, shared printing capability, and the planned on-line Library Automation system. Also, additional IBM compatible microcomputers were purchased, our first run of fiber-optic cable and quantities of four-pair copper wiring to individual faculty offices and student stations were installed.

A second state bond issue in late 1986 provided another small jolt of funding with which we purchased additional PC's, more copper wiring, expansion of the ISN and another run of fiber-optic cable.

In 1986, the ACS Coordinator position was still one-quarter of a faculty member's load and a new full time position was established, that of Manager of ACS. This professional staff position reported to the ACS Coordinator and handled hardware and software installation and maintenance, work-study supervision, user services of all kinds, and hardware and software product and vendor recommendations. Clerical support was supplied as a portion of the responsibility of a Division Secretary. Approximately sixty hours of work-study time were required each week to keep the ACS facility fully functional.

In the realm of Distance Education, in October 1986 U. S. Dept. of Education Title III funding was received for a three year project to establish a two-way-television system connecting the campus with the two off-campus centers. This was intended to enhance programs at those locations through increased involvement of regular full-time faculty and increased course and program offerings. This was accomplished through a microwave link to LAFB and a fiber link to Houlton. This system began operation in the fall of 1988 and began administratively and budgetarily under soft money.

The department of media services had been physically moved to the basement of the Library and Learning Resources Center when it was constructed in 1975 and was organizationally under the director of this facility. It has traditionally consisted of approximately 1.5 full time equivalent professionals and heavily utilized student help. Its budget was not separate from that of the Library and was often minuscule.

III. Status in Fall 88

Personnel

At this time there was a one-quarter time Coordinator, a full time Manager and a part of a Division Secretary's time devoted to Academic Computing Services. The two-way-television project had a soft-money technician, with supervision provided by a Division Chair. Media services including rudimentary television production involved one full and one part time person reporting to the Director of the Library and Learning Resources Center.

It should be mentioned here that throughout all this, the campus has kept administrative computing quite separate and under a different vice president. Most of the computing done here is mainframe based and therefor very much under the penumbra of the University System mainframe organization, CAPS. On this campus, administrative computing has been understaffed and has suffered from lack of an organized training effort and a necessary focus on day-to-day needs. The Direction of Administrative Computing is only a part of the job of the Director of Accounting. There is a part time assistant position held by various individuals which has been vacant much of the time.

Demands for Services

There were increasing demands by faculty, students and others for the services which were reasonably expected from the technological staff, particularly ACS. Recent additions to the workload included providing access to a new televised campus news bulletin service from the University Relations Office, a steadily increasing number of courses which required computer use either explicitly or implicitly, and a library automation system which includes an on-line catalog, acquisition and circulation had been established within the University System.

There has been a need for a modern student information system on this campus. The University System provides a mainframe based system. This handles traditional aspects of record keeping but has little to offer in the way of student tracking, easily accessible information for academic advising, program planning and assessment or institutional research.

Significant progress had been made by many faculty in computer literacy through self study and their own professional resources. Close to half of our faculty were aware of the uses being made of computing within their field or discipline. ACS had been unable to provide much organized training of its users, including the faculty. The ACS Manager has spent considerable time in a one-on-one basis with some faculty because they did not know the basics of the standard MS-DOS operating system or other fundamentals.

Hardware

Hardware at this time consisted of the ISN installed in 1885, and upgraded in 1987. It operated at serial speed and connected ninety-six ports including twenty-two ports on two AT&T 3B2 minicomputers, models 300 and 400.

In reference to the 1984 five year plan, the twenty computers now in use by faculty (including Division Chairs) were very close to the anticipated ratio of one to four. There were approximately twenty-four computers for student access which was about one per fifty-eight students. This was a long way from our goal of one keyboard per twenty-five or from one to about twelve maintained by some schools. The difference between our projected ratio and the actual one was due to the almost total elimination of terminals, a loss of about five machines due to failure, and a student body of 1400 as opposed to the anticipated 1200.

Other material resources included a flat-bed plotter, a few pieces of UNIX based software, miscellaneous MS-DOS and Apple II software, an LCD overhead projection panel, and several printers and switch boxes.

Facilities

One of our three dormitories now had two microcomputers, one of which was purchased partially with student raised funds, with no software and no access to CAPS. The Library had three microcomputers for public use and, through these, access to the network.

Software distribution through the library or other centers had never been very successful. By 1988, software distribution had evolved dramatically due to changes in technology and availability of bond issue monies for the campus network. We were still distributing some software on floppy disks but also had a word processor and an integrated package available on the minicomputers and the Information Systems Network. Unfortunately the system could handle only about twelve to fifteen simultaneous users, which severely limited its effectiveness when an entire class was on-line.

The concept of central computers for groups of faculty quickly gave way to individually operated machines. The network reached into each faculty office providing access to the mini-computers, to CAPS and electronic mail. The Open Computer Lab now held seven Apple computers. This was mainly used by Education majors. The Closed Computer Lab was very different from what was anticipated in 1984. This room now combined the features of an open lab with a classroom and was at best a compromise. Most of the student accessible machines were here, but due to scheduling of classes and lack of attendants it was not open nearly enough. The open hours of this facility needed

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to approximate those of the library. We had progressed very little in providing for the instructional laboratories. One classroom had access to the network, and two large monitors were available for mobile use.

Programs

This configuration of hardware was supporting computer literacy classes, Pascal programming, two word-processing oriented composition classes, business computing classes, introduction to computing classes for Education majors and general word-processing for student use. A fledgling degree program in Academic Computing had been withdrawn. We had a very weak minor in Computer Science having little available faculty expertise or time to devote to it. The primary use of our computer facilities was for word processing, programming classes, computer literacy classes of a generic nature, as well as for various specialties such as business and education, and other various computer supported instruction.

All student accessible machines were on campus and none at the off-campus Centers. WordPerfect, Smartware and a Pascal compiler were available on the AT&T minicomputers. Business students were using software accompanying their texts, and what Apple software we had was manually distributed.

Budget

The annual ACS operating budget had been $8500 for several years. A widely used method of determining annual replacement and maintenance costs on this type of equipment is to take 10% of the value of the equipment. This does not allow for any expansion or upgrading of equipment or services. The past two bond issues for the University of Maine System had provided somewhat more than $200,000 in computing equipment at Presque Isle. If we ignored any equipment on hand before 1985 this indicated that our maintenance budget should have been in excess of $20,000 per year. We had about $8,800 of outstanding requests from faculty for computing equipment and support software. The only equipment on which we had maintenance contracts were the two mini-computers. While it would not have been cost effective to put many of the items on such a contract, it would have been reassuring to have the Information Systems Network on such a contract as we were growing ever more dependent on it.

IV. Introspection

ACS was facing a personnel and budget crisis. The campus budget allotment for the academic year was estimated to be adequate to support operations to a minimum level only till the end of the first semester. Requests for services far exceeded our ability to respond. We were frequently experiencing equipment failure and damage due to inadequate lightening and heat

protection. Each failure decreased the reliablilty of the system and had its cost in staff time.

A status report was prepared by the Coordinator of ACS. In this report a complete description of the current status of hardware, software, services, budget and personnel was given an analysis of the situation at that point. This document contained the information presented above and some concrete proposals. These included: increased staff, hard-drives and software for dormitory computers, meeting most urgent faculty requests for hardware and software, maintenance contracts for critical network components, additional networked machines for students in the Library, additional networking to reduce the manual software distribution, additional printers, lightening protection and strategic air conditioning.

While this document was not a new five year plan or an exhaustive study of instructional technology at University of Maine Presque Isle, it was suggested that all instructional technology should be thought of as a unit since there is so much overlap in the media, necessary skills, and space and equipment requirements. For example, conduits can carry voice, data, and video transmission media, video projection devices and monitors can enable data or video viewing. Technical skills required to construct or maintain one type of equipment are transferrable to other types, management of equipment and equipment access and distribution issues have similarities in all areas, and equipment from each area can be interconnected for the enhancement of each.

V. EDUCOM Consultant

Two important results of the above introspective status report of the fall of 1988 included additional one-time budget money to address several of the specific immediate needs.

A more significant result was support from the Academic Vice President to select and hire a consultant for the entire academic technology area. Since the area was seen to extend over media services, interactive television, academic computing, library automation and student information systems it was necessary to favor some areas over others in the selection of a consultant. Because our distance learning project seemed comparatively more mature and the other areas were more minor in scope we favored ACS and selected the EDUCOM Consultants Bureau. Dr. Larry Bielawski, Director of Academic Computing at Goucher College spent two days on campus and talked with over fifty individuals representing students, faculty and staff on various technological application aspects. This resulted in a comprehensive report which focused on five specific areas of need:

1) Lack of a clearly articulated vision or goal for UMPI'S educational technology program.

2) Ineffective management of diverse areas of instructional technology as a result of no central office charged with overseeing technology development and implementation.

3) Poor space allocation and access to educational technology, leading to inequitable resource distribution and lack of programmatic impact.

4) Severe budget constraints causing maintenance and upgrading problems to the point of program degradation.

5) Inability to take advantage of newer, more-capable technologies, including networking hardware.

Several fairly specific suggestions were made to address these areas of need which were incorporated into the project described below.

When the report of the consultant was received, the campus was in the process of writing an application for a new $600,000 Title III grant for the next three years and focusing on the areas of student assessment, advising, tracking, and retention. A second and related activity involved the establishment of a Learning Center with new positions of Director and Writing Specialist. With the EDUCOM Consultant's report in hand, the application was expanded to a $2.5 million five year project with heavy emphasis on the establishment of an Office of Educational Technology and cooperative arrangements with the other two activities. This expanded project received U. S. Department of Education funding starting in October of 1989.

VI. Title III project

A major thrust of this project is to upgrade information technology services to the institution over the five year period from October 1989 through September 1994. In particular, the following are in progress:

* An office of Educational Technology has been established under the Academic Vice President. This office consolidates the functions of ACS, Instructional Television, Media services, Library Automation, and Student Information for tracking, advising, and program review. The consolidation involves the sharing of maintenance, purchasing, personnel and training.

The office staff consists of a Director, Administrative Assistant, Manager of Academic Computing Services, User Services Specialist, Manager of Instructional Television Services, Instructional Designer, Coordinator of Media Services and Television Production, and a Data Specialist.

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* A program of faculty and staff professional development opportunities has been instituted. This provides funds for travel, workshops, and software to enhance classes, research and programs.

* All faculty who have a need for computer resources are provided with basic equipment, software and appropriate training, for increased productivity in teaching, research, and data collection.

* A maintenance facility has been equipped with diagnostic equipment, tools and spare parts. All computer, television and media related equipment has been recently inspected and inventoried. An appropriate program of preventative maintenance will be established for each type of equipment.

* Assist in the design and equipping of the University Learning Center Laboratory which is developing under another activity of the grant. The Center is to incorporate the use of microcomputers for computer assisted instruction, including the use of word processing as a learning tool. A twenty machine networked lab will be dedicated to developmental instruction and student assessment.

In future years the Title III project will enable the following activities:

* A satellite down-link interconnected with all other video networking services and instructional services.

* Enhanced video production capabilities through additional hardware, staff training and increased staff.

* Improved instructional design services through capabilities of desk-top publishing and graphics production.

* Increased exposure of Education majors to the uses of computer technology in the public school through additional equipment, software and curriculum revision.

* Enhanced the broadcasting curriculum through an audio production facility.

* Enhanced science instruction through use of interactive video-disk and camera equipped microscopes.

* A computer and software purchase program for students, faculty and staff.

* A 10 megabit campus local area network to bring software,

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printing resources, CAPS, INTERNET, library automation, student information, and other services to all appropriate buildings on campus.

* Upgraded student computer accessibility at off campus Centers through networked equipment, similar to that on campus.

* Improved access to reference material and indexes by installation of CD-ROM services in library and on the network.

* An easily accessible comprehensive Student Information Database for faculty and staff to assist with student tracking, advising and assessment of college programs.

The two way television system connecting the campus with its two off campus Centers has been operating since the fall of 1988 with an increasing schedule of classes and is currently offering approximately eight classes each semester. A state and federally funded statewide interactive television system has been operating since the fall of 1989. Both of these systems are administered by the Office of Educational Technology and are thoroughly integrated into all its activities.

The synergy created through the existence of the office has begun other initiatives not anticipated explicitly at the start of the project. Among these are the establishment of a facility which combines a second interactive television classroom, interactive conference capability and media presentation room. This has been accomplished through cooperation with the extensive statewide interactive television project and several other on and off campus entities. Data signals now piggy-back on television signals to off campus Centers. Negotiations with a local cable company will result in mutually beneficial projects, including the enhancement of a campus channel. Art faculty are actively planning the first of a proposed sequence of television production courses. Cooperation with the institutional research office has opened new avenues of potential for a strategic management system to include the already planned student information system.

VII. New Directions

Areas which are certainly related are inter-and intra-campus voice communication, electronic laboratory equipment, and campus radio broadcast and production facilities. There are also areas of activity which are technological and allied with the above but which are not instructional in nature. These include administrative computing, and some of the voice and data communication. Although there has always been a cordial relationship with administrative computing on campus there has never been formal or structured cooperation. A three person coordinating team consisting of the Director of Educational

Technology, the Director of Administrative Computing and the Director of Institutional Research is to be established and charged. This should enable further economies of scale in maintenance and training and facilitate many projects through shared information and expertise.

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NOVEMBER 27-30, 1990

TRACK II

FUNDING AND ACCOUNTABILITY

Coordinator: William Joseph, Virginia Wesleyan College

Do we know what information technology is costing our institution? How do we determine what is needed versus what is desired? Papers in this track focus on daily funding and accountability problems, the related management of growth, and funding relationships in higher education.

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ACHIEVING EXCELLENCE IN ACADEMIC COMPUTING

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Survival in the decade of the nineties will require a campus to achieve excellence in one or more areas. The resources of the computer hardware vendors are one solution to achieving excellence in academic computing.

The hardware vendor is likely to develop a partnership with a campus if the vendor's architecture, technology and software become the keystone of the academic computing plan. An RFP designed as a performance specification will encourage vendors to respond in support of the academic computing plans.

This approach allows the vendor to bring to the campus the critical personnel and financial resources necessary to achieve excellence for both the campus and the vendor. The selection process therefore turns on the amount of resources the vendor will commit to the campus and the extent to which the vendor's solutions achieve the level of excellence specified in the academic computing plan.

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Let us now turn our attention to an analysis of this summary of developing a partnership between the hardware vendor and the small college and university.

The Goal

Within the area of academic computing, it is appropriate and logical for the small college and university to establish the goal to become the most sophisticated academic computing campus in its region for a teaching college or university with approximately a 2,000 full time undergraduate enrollment. Such a goal has as its objective the attraction of sophisticated computer students not only to sustain its enrollment objectives, but to establish the base for an enhanced academic computing environment. Such a goal also will energize and motivate current faculty who yet may not have achieved acceptable levels of computer literacy. Additionally, this goal will provide an attraction to draw new computer oriented faculty to the campus; not only computer science faculty, but faculty from all disciplines whose interest and future include the necessity of a computing environment.

The most important aspect in the decision to establish this goal is the commitment to enlist the expertise and financial support for such a program from the computer hardware vendors. This is the hallmark of this entire approach. The small college or university does not have the financial, technical or human resources to carry off this kind of quantum leap into the world of an advanced and sophisticated computing environment. Usually, the computing center staff will consist of a director who does possess significant expertise, but that person is generally torn between various and sundry technical and administrative

responsibilities that prohibit the devotion of his or her expertise to designing and implementing a sophisticated computing environment. The remainder of the center staff, usually three to five more people, are entry level professionals without the ability to either assume management of the center during a design and implementation phase or the ability to assist significantly in a design and implementation program.

The Plan of Action

When all is said and done, there still remains one small item to be accomplished: how to get from here to there! How to bring a campus with a mediocre or modest academic computing environment to the level where it honestly can be positioned as having the most sophisticated academic computing environment in the region for a small teaching college or university.

The plan of action that the college or university must complete before it makes any contact with hardware vendors is the development of a five year strategic plan, a five year plan for academic computing and a specific design for academic computing on campus.

First, the college or university must develop a strategic plan to demonstrate that it has its goals and mission clearly stated; and that these goals and mission show that this is a campus looking forward in an aggressive mode that places an emphasis on excellence in carrying out its mission and achieving its goals. The most important part of this five year strategic plan is its financial model. Without a financial model that projects enrollments, tuitions and expenditures, the five year strategic plan becomes an academic exercise in rhetoric and euphemisms. Even more importantly, academic computing must be clearly displayed in this financial model so that the hardware vendor is assured of the viability of the campus as a potential customer.

Second, the overall University five year strategic plan must devote a reasonable section to academic computing. However this will not substitute for an academic computing plan that is separately written and covers a period of not less than five years. Throughout the academic computing plan there must be a constant emphasis that this plan is a complete reordering of academic computing on the campus, with the design objective to be the establishment and acquisition of leading edge technology in all areas of academic computing.

Third, the specific design for academic computing that will serve as the link between the academic computing plan and the request for proposals should focus around the development by one

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vendor of a central facility, a totally networked campus and departmental computing. The central facility is not a traditional computer center, but is a hub in a distributed system to handle high volume in complex computing as well as being a location for specialized hardware and software. The network will bring together every single space on campus into a design of universal connectivity in an open architecture format; and most significantly, the network will provide unlimited external access through the national and international computing network systems. While departmental computing plans may anticipate a variety of vendors, there must be the ability to access files throughout the network with restrictions to such files based only on policy and security reasons.

This design concept is a critical element in attracting the computer vendor to the campus and in developing a contract with that vendor. It is critical to interact with the vendor in a focused and highly specific manner in order to avoid vendor and university exchanges and agreements that do not include specific hardware, software and other support services associated with definite dollar amounts for each item. Therefore, we can summarize this first major phase of a university's attempt to achieve excellence in academic computing by stating that this goal means the establishment of a sophisticated computing environment in three components: a central facility, a universal network, and peripheral equipment, all operating in an open environment of connectivity and communication.

Campus Resources

As we move to detail of the specific approaches to attracting a hardware vendor to a partnership with the university, our analysis will no longer be academic or technical. From now on, our discussions will center on the financial. At a later point, we will address the interaction of vendor selection and hardware and software evaluation.

The campus has two basic resources to bring to the table upon which the partnership will be written: the computing expense budget and the computing personnel budget. The computing expense budget are those costs associated with hardware and software, such as, maintenance, licenses, and financing costs. These dollar amounts should be known and used as a basis for determining how much money the university can spend towards the accomplishment of its goal. The financial model in the strategic plan will have addressed the fact that these dollars will increase from the thirteenth month after installation of new systems until the end of the planning projection. The first twelve months of installation are generally under a warranty program that negates the need for any maintenance costs;

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therefore such costs may be allocated to the acquisition of hardware and software.

The computing personnel budget, unlike the expense budget, must increase at the beginning of the installation of new hardware and software technologies. It would be an unusual situation indeed to find a small university computer center adequately staffed to provide the significant academic user support services that will be required to utilize the state of the art hardware and software that is arriving on campus. Simply stated, if this is not a component of the academic computing financial model, it is prudent not to proceed further. In order to quantify this factor and place it in proper fiscal perspective, the increase in personnel means one professional staff person devoted to academic user support services for the first two years of installation and one more similar person added to the staff at the beginning of the third year. Presuming one such professional already exists on most university campuses, this staffing presumes that the director will have three professionals to support the hardware and software needs of the academic users, including student users.

Vendor Resources

The purpose of a partnership with a hardware vendor is to augment the resources of the campus so that the two together - the vendor and the campus - may move the campus forward to achieve excellence in academic computing. So at the outset, the first resource in importance that the vendor brings to the campus is the simple fact that the vendor becomes a partner with the campus. By attracting the vendor to the campus, the campus is able to make a statement that we are in partnership with this major national computing vendor - and that is something special that sets this campus apart from others.

Secondly, however, to establish this necessary partnership, the campus must be flexible in the specific hardware and software technologies that it is seeking so that compatibility of university academic computing goals will not be in conflict with what major computer vendors are able to provide. A partnership is a mutual relationship where each partner contributes to the other and works with the other towards a mutual goal; if the campus is rigid and predetermined, they cannot achieve a partnership that will produce the maximum for the campus.

Third, a critical, and perhaps the least expensive, aspect of this partnership is the assurance by the vendor that the campus will have access to its engineers and always be considered as a beta site when it is appropriate and logical. If after all

of the efforts of a strategic plan, an academic computing plan, vendor selection and hardware and software installation, there is no commitment by either the campus or the vendor to continue to look to the horizon and upgrade and maintain the position of advanced technology, then the campus will quickly sink back down to the level of a mundane and pedestrian academic computing environment.

Fourth, the campus must insure that the vendor brings to the partnership the very latest leading edge hardware and software available; not what the vendor believes the campus is currently ready to accept. This whole process we have been reviewing can be perceived as a change agent. And simply to supply the campus with more of the same will result in just that - more of the same mundane and pedestrian computing. Not only must the vendor bring to the partnership the current state of the art, but plans must be laid for easy access to future upgrades.

Fifth, the major computer vendors have the very significant resource of being able to provide a variety of financing options for the acquisition of hardware and software. While not commonly referred to as financing options, the various lease plans should be thought of in that perspective so that we may feel comfortable in working with the selected vendor and adjusting the costs of acquisition and continued maintenance into a payment program that will meet the campus's particular budget requirements. One should think of the acquisition of hardware and software not as a purchase, but as a budgeted expense that can be projected into the future. This is not a static or simplistic calculation, such as a mortgage amortization schedule, but rather a complex negotiation that factors in such variables as delivery schedule, acceptance dates, financing charges and whether or not the institution may qualify for tax exempt financing. It is at this point that the vendor can make the program work or not.

Finally, a major national computing vendor brings to a partnership the enormous publicity that such an organization can generate. Whether it is publicity simply within its own client base, or in the rare few instances where the publicity is national, this is the kind of recognition that enhances recruitment of students and faculty as well as energizes the current campus community. Free surplus equipment from the local insurance company, bank or anyone else making such contributions not only does not satisfy the requirement for state of the art technology, but brings with it absolutely no prestige or publicity. Only the major vendors can bring this to a partnership. And for the small university, it requires the partnership aspect to obtain this vendor commitment; a simple sale of a few P.C.'s or a workstation on an irregular basis will not generate a partnership.

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The Request for Proposals

Now that we know what we want to do and what we want to accomplish and the resources that we have to do it, all we have to do is do it! Easier said than done. The vehicle to accomplish the campus objective is the request for proposals. Normally, these requests are a statement to the vendor of what is desired and the response from the vendor is how much it will cost.

In developing a partnership to achieve excellence, we instead should make the request for proposals an open invitation to all vendors to respond to our goals and expectations as we have defined them. Put another way, the small university should write a performance specification instead of attempting to specify in detail hardware that it wishes.

Yes, the request for proposals has to include all of the administrative and legal boiler plate that is common and available. But once that is over and done with and duly entered into the bound version, the most important aspect of the request is a full presentation of the academic goals and a clear invitation to the vendor to design solutions towards that academic goal. To repeat what was stated earlier, the academic goal states that the university wishes to become the most sophisticated academic computing environment in the region for a teaching university under 2500 students. It anticipates accomplishing this objective by developing a central computing facility, a totally networked campus and providing to faculty and students appropriate and state of the art peripheral equipment such as P.C.'s, workstations, terminals and printers. While this does become expanded in a full request for proposals, that theme is repeated over and over again to the vendor, always concluding with the question: what is your design solution for our campus. Emphasis must be made that the campus anticipates a design solution that presumes a full partnership with the vendor.

A critical aspect of the request for proposals is the evaluation process that will be utilized by the campus. The vendor should know ahead of time that it will be an open process in which the two main evaluative criteria will be vendor technological creativity and vendor financial creativity. This is an evaluation process that places weight on the whole solution as opposed to individual segments.

Besides total cost and financing options, warranty and maintenance are clearly major financial issues. Therefore, the request for proposals should specifically request that the vendors address options to reduce these financial burdens; invite extended warranties and reduced maintenance cost programs.

When all is said and done, we come to the critical question of how do you choose one vendor over another. First, the choice should be a ranking based on technology and design solutions to the performance specifications. The process for doing that is not the intent of this presentation.

Rather, we are concerned with the second focus of competition: the total cost of the whole project. The project is the central facility, the network and peripheral equipment. Add it all up and there is a total cost. To that cost must be added maintenance. Subtracted from that cost is the grant support that comes from the partnership. When all is said and done, a partnership means, among other things, that the vendor will provide greater than normal discounts or free hardware and software. Let me hasten to add that the partnership will provide many other options that we have described above; but at this stage we must be price sensitive. We have ranked the vendors by their technological solution and have determined which would provide acceptable solutions to the campus goal of achieving excellence. Now to state it again, we are at the price sensitive stage whereby we will enter into a partnership with the vendor who provides the hardware and software for our needs at the lowest price.

The critical element in a negotiation that will take place at this stage between the two or three vendors ranked highest based on technology is that the campus negotiators be open and honest with the vendors. The vendors must understand that the campus has reached a decision where vendor A, B and C would all be acceptable. Therefore, the only issue remaining for discussion is the bottom line. The bottom line is more important than however the vendors wish to price individual items. An extra year of warranty is a deliverable for which there is no charge and reduces the bottom line. A positive response from the vendor to provide hardware and software for specific programs means that a specific amount of peripheral equipment is delivered free or at a greater than normal discount.

After a round robin process of dialogue with each vendor to determine what their actual lowest price will be is complete, then the choice is made for the lowest price. If the total prices are all very close, perhaps within $20,000 to $30,000, than the choice should revert back to technological factors that differentiate one vendor from another.

The Balance and the Choice

What we have tried to accomplish is to place the small college or university in the same bargaining position as major research universities. The hardware vendor does not sell the

product to the entire research university all at once. Rather, each program or department in the university operates almost as an individual customer, able perhaps to spend a half a million dollars a year with the support of university and sponsored research funds. With this approach for the small college and university, we have said to the hardware vendor that we will buy from you the entire computing solution that you have designed so that we may achieve our goals of academic excellence. We have said to the computing vendor that here is our academic computing goal and our basic performance specification - how would your company fulfill this performance specification? In this way, we become a large customer in much the same way as a department or division in a major research university - we too will spend in excess of a half million dollars in this year.

Case Study: Sacred Heart University

Sacred Heart University is a small independent teaching university located in Fairfield, Connecticut. It has approximately 1400 full time undergraduate students, 1800 part time undergraduate students and 1100 part time graduate students.

Sacred Heart University has taken an aggressive posture that it will achieve excellence within its mission to serve the students of Connecticut and the surrounding northeast region. The University believes that for each student it accepts, it will attempt to provide an excellent education, whether in basic studies, the humanities, business or science. In short, the goal of the University is to achieve excellence as a teaching university.

Sacred Heart University has a five year strategic plan that states its mission and goals. It is a public document and has become the core of the University's decision-making process. When decisions are made, the University asks how does this relate to the strategic plan.

In the Spring of 1989, the University formed an academic computing committee to write a five year plan that was completed at the end of 1989. That plan was considered as a subset of the University five year strategic plan. Thus, they are intertwined and support one another. Most importantly, the financial modeling in the strategic plan included funding of academic computing over and above inflationary increases.

To bring this academic computing plan to life, the University issued a request for proposals that followed the precepts described previously. The University received responses from seven nationally known computer vendors who provided total solutions to its performance specifications.

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The Academic Computing Committee evaluated those seven proposals and recommended further review of three of them. Following that further review, two were selected by the Academic Computing Committee and the University Administration as being equally acceptable as partners with the University to achieve our goals of excellence.

Negotiations are underway with these two vendors, with the final decision resting entirely upon price.

No matter which of these two national vendors the University selects, we will have made the correct choice of a partner. Sacred Heart University brings to the partnership its aggressive posture in seeking excellence in academic computing. The selected vendor will bring to the partnership all of its hardware, software and engineering resources as well as a commitment that the University will be offered the opportunities to be a beta site for the development of appropriate new hardware and software.

The process works and Sacred Heart University will move from having a pedestrian mundane computing environment to having one of the most advanced academic computing environments in the northeast United States.

A DISTRIBUTED MICROCOMPUTER BASED MODEL THAT INTEGRATES THE PLANNING/BUDGETING PROCESS FOR AN ENTIRE UNIVERSITY-- A CASE STUDY

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Attempting to integrate the various planning and budgeting processes that normally are found on a university campus is a challenging and often, very difficult undertaking. At Eastern Washington University, strong leadership on the part of the university's president and provost and a micro-computer based model have enabled the organization to take a giant step forward toward realizing that goal. The computer model placed a fairly sophisticated analytic tool in the hands of the departmental planners with which alternative strategies could be evaluated over a multi-year time frame. This study explains how the computer model fit into the overall planning process of the university and evaluates the effectiveness of its use.

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A DISTRIBUTED MICROCOMPUTER BASED MODEL THAT INTEGRATES THE PLANNING/BUDGETING PROCESS FOR AN ENTIRE UNIVERSITY—A CASE STUDY

"The "new" strategic plan, and planning process, must necessarily be "bottom-up." Assessing the ability (and necessary skills) to execute-to be responsive, flexible, attentive to customers-starts on the front line. Obviously, as the process moves forward, it will involve debate among senior officers, and compromise. But it should never lose touch with or sight of the front line, where execution takes place."

Tom Peters
Thriving on Chaos

INTRODUCTION

Following a period of expansion in the '70s and early '80s, Eastern Washington University began to feel the pinch of that expansion in the form of an overextended budget. There was also a change in presidents at the university. External to the university, but at about the same time, the State of Washington through the Higher Education Coordinating Board had developed a master plan for public higher education, including the identification of long range program parameters for each of the state's public universities. The result of these internal and external conditions was a great deal of uncertainty within the university about what directions the university would pursue and how it would go about doing so.

To address this problem, the university under the leadership of the president and provost set out to clarify what the university would try to achieve over the next several years and to gain consensus within the university on how that should be done. The vehicle they chose to accomplish these ends was, not surprisingly, implementation of a strategic planning process. And so, in the last several years, the administration in consultation with faculty, staff, and students has rewritten its mission statement, clarified programmatic responsibilities, and consolidated previous gains in an effort to better prepare the university for the future.

This paper provides an overview of the process utilized by Eastern Washington University to bring about the redirection of the university. Particular attention is devoted to the microcomputer based model which has been the key to successful integration of the university's planning and budgeting processes.

UNIVERSITY PLANNING/BUDGETING PROCESS

University process

As noted earlier, the State of Washington through the Higher Education Coordinating Board had provided some very broad directional statements for Eastern in the master plan for higher education. In concert with the directions established in the master plan, the university began to develop a statement of widely accepted and supported goals for the

university in the fall of 1988. As a result of those efforts, three goal categories were identified:

1. learning;
2. student development; and
3. university management.

In addition, goal statements and critical success factors were identified under each of these categories. These statements provided overall direction for the university and laid the foundation for initiating a comprehensive planning process in the 1989-90 academic year.

Stages of development

To address the need for faculty and staff participation in developing and implementing the university's plans, a process was designed which can be characterized as a "bottom-up" approach. In other words, to achieve the desired broad-based participation and consensus, the process was designed to occur in four developmental stages:

1. department plans;
2. college or division plans;
3. vice presidents' plans; and
4. university-wide plans.

In this four-stage, "bottom-up" process, plans are rolled up to the next higher level, where they become the basis for developing the succeeding level's plans. The process continues until the final university plans are completed and adopted by the university's Board of Trustees. This approach enables all constituent groups in the university community to express and promote their values and priorities in shaping the university's agenda for the planning period.

Expected Outcomes

The planning process was initiated with the expectation that a number of products would result from its implementation. The most tangible outcomes of the process are program plans and budgets at department, college or division level, vice presidents, and university level. At each of the four developmental stages, plans have been produced which include: vision narrative - a description of the program as it will exist at the close of the six year planning period; strategies - the key actions or decision points which must be implemented each biennium of the plan period to bring about the changes called for in the vision narrative; and operational plans - the resource requirements (operating and capital) necessary to implement the strategies.

The operational plans are developed using the micro-based resource requirements model and essentially represent the annual operating and capital budgets required to implement the program directions identified in the vision narrative and strategies. This is a critical aspect of the university's process which differentiates it from most attempts to link planning and budgeting. Rather than going through separate exercises for planning and budgeting, we have integrated the two; the tool we have utilized to accomplish this

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integration is the resource requirements model.

Typically, universities have planning processes which are separate and distinct from the budget process. It is this separation which encourages decision-makers to be unwilling to make hard choices in the planning process in the same manner that they must be made in the resource allocation process. Often, the result of this phenomenon is that plans are adopted requiring resources far beyond those available to the university. As a result, when the budget process begins, the plans are set aside and decisions are made with little or no reference to the plans.

With the demographics of the later part of this decade soon to be upon us, effective planning for replacement of faculty members is critical to the viability of the university. The plans under development will enable the university to evaluate where anticipated vacancies will occur and initiate appropriate recruiting measures to replace retiring faculty.

The information derived from the process for information technology and facilities will also be used to develop a campus technology plan and a campus facilities master plan. These efforts are commonly not integrated into a university's planning process; they are more likely to be operating separately, leading to decisions which are not in agreement with one another in the choice of program direction, technology requirements and facilities needs. By including these key elements in the overall planning process, the university hopes to achieve an integration of program planning, information technology planning, facilities planning, and budget development.

In addition to the tangible outcomes which the plans and budgets represent, there have been a number of very significant intangible outcomes of the process. Some examples include: development of a broad base of understanding and support for the directions established for the university; and the incorporation of longer term programmatic goals in short term operational decision-making processes throughout the university. In an organization as diverse as a university these outcomes are significant, yet difficult to achieve.

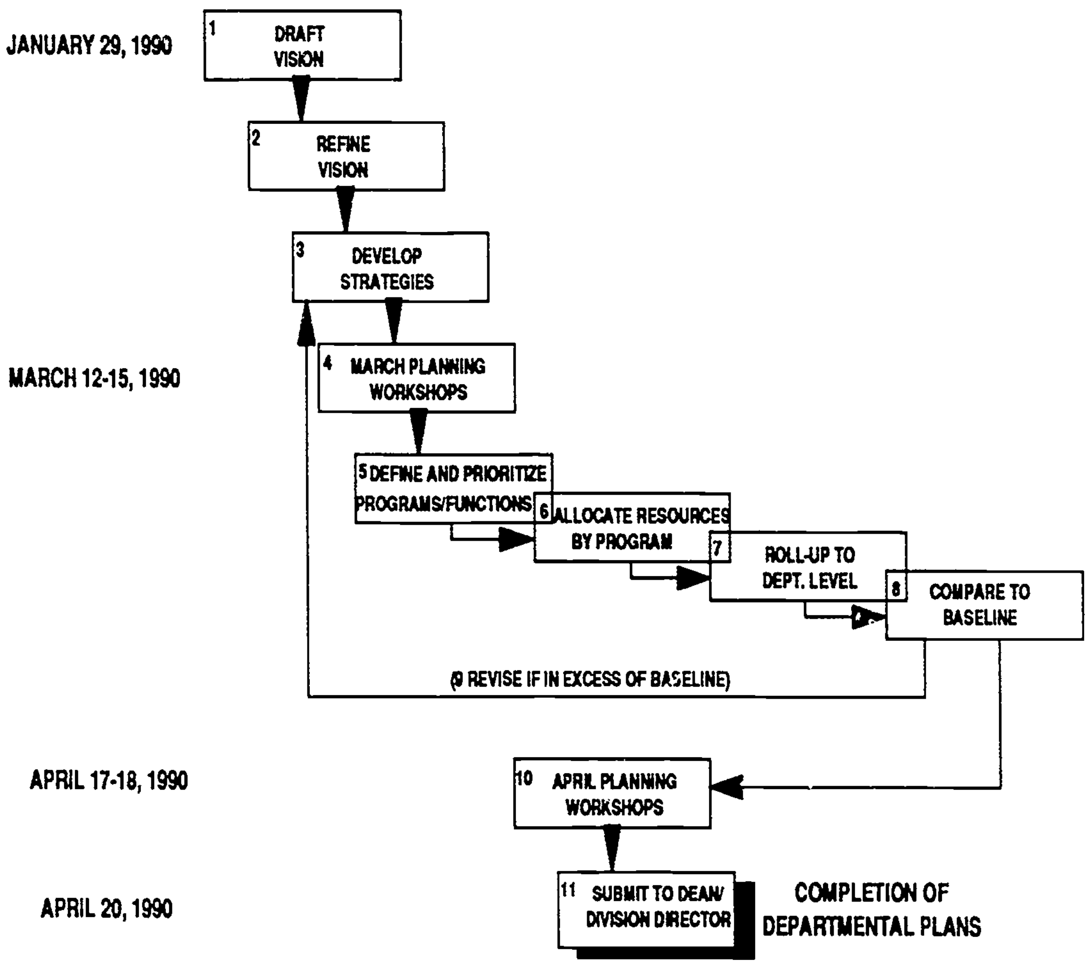
The next section describes the steps the departments went through in developing their plans and recommendations.

Departmental planning/budgeting process

Each department followed the same series of eleven steps in developing their plans; they are displayed in the diagram below.

EASTERN WASHINGTON UNIVERSITY PLANNING PROCESS

I. DEPARTMENTAL PLANS



STEP ONE was development of the components of the vision narrative. STEP TWO was to ensure that the vision directly addressed accomplishment of university goals and did so within the parameters established by the university planning process assumption. STEP THREE required development of strategies for each biennium (two year period) of the six year planning period. STEP FOUR was a series of workshops which provided departments with the opportunity to discuss interdepartmental and intradepartmental program link-

ages. In addition, deans and division directors reviewed the progress of departmental plans and provided feedback on the directions being taken by departments. The greater the involvement early on in the planning process of senior managers, the less need there was of substantive changes in the plans at subsequent stages of development. These workshops were also used to introduce the resource requirements model to the planning process participants.

STEPS FIVE through EIGHT required use of the resource requirements model software (the model is discussed in greater detail in a later section of the paper). These steps include identification and prioritization of departmental programs or services as well as the resources necessary to support them. At this point, departments had completed their plans requiring resources equal to 1XX% of their baseline budgets.

STEP NINE applied only to the 100% of baseline scenario. This meant going back to STEP THREE and reworking strategies and operational plans until they did not exceed the baseline funding amounts provided in the model. STEP TEN was a second series of workshops in which departments presented their final plans including: vision narrative, strategies (two scenarios - 100% and 1XX% of baseline), and operational plans (two scenarios - 100% and 1XX% of baseline). As a result of information received in the workshops, departments made any final modifications to their plans. STEP ELEVEN was the final step in the first stage of the university's planning development process. Departments submitted a complete set of their plans, including vision narrative, strategies, and operational plans (hardcopy and diskette) to their dean or division director.

The subsequent stages of development followed essentially the same series of steps as the ones outlined above, but were based on roll-ups of the departmental plans. When changes were made in the later stages of development, managers were required to go back and revise the departmental plans accordingly. This process required extensive dialogue between the different levels of management in the university.

Integration with information technology plan

The planning process for the use of information technology is often a stand alone process at many universities. The drawback of such a process is that the requirements or needs identification process usually is conducted by an information technology planning study team. In an integrated university planning process, the information on the individual functions requirements and needs are submitted up through the organization itself. This makes the aggre· ·tion of needs as well as the priority setting process much simpler. The following diagr ·n shows how the IT planning process at Eastern Washington University has been integrated into the overall university planning process.

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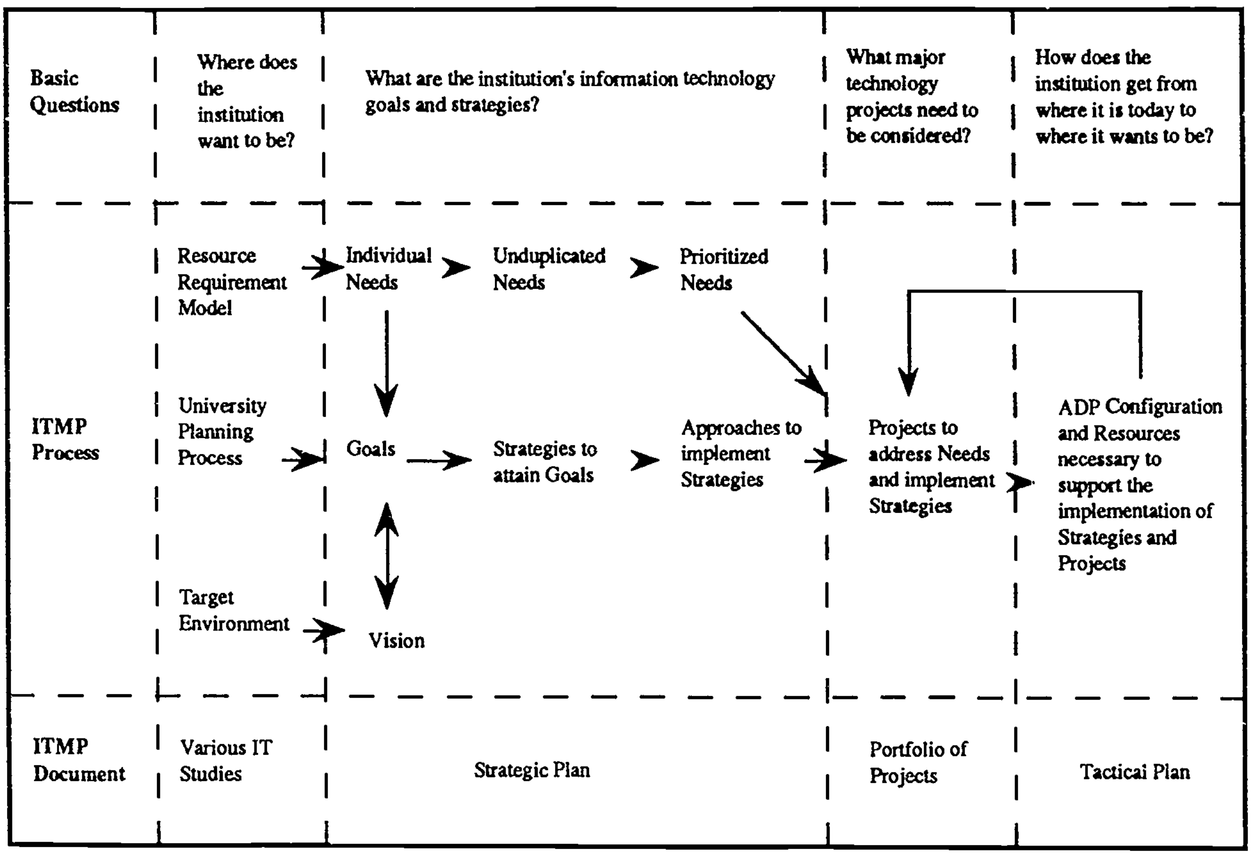
Information Technology Master Plan Paradigm



Even though it must lag behind the overall university planning process the IT plan results will be considered equally along with all the other organization units plans. Recommended priorities for technology projects for the entire university will be done by the university IT governance groups. The final information technology plan will follow a format and process similar to that commonly required within the State of Washington.

INFORMATION TECHNOLOGY PLAN

One of the goals of the information technology planning process is to integrate information technology planning with agency business planning. The following is the suggested format for technology plans from the State of Washington.

Agency Business Planning

- Define the agency's business (agency mission)
- Define the business strategy (what strategies will be employed to improve effectiveness?)
- Develop and document agency goals and objectives
- Define agency business activities
- Define agency information requirements to support business activities
- Define information technology's role in supporting the business strategy
- Identify inter-agency cooperative initiatives

State Information Technology Principles

Each agency is responsible for managing the information technology resources necessary to carry out the mission of the agency. Agency plans will be consistent with the overall state strategic direction.

All data collected, generated, and used by state agencies is managed as a resource of the state. Agencies share data across organizational lines to meet program needs, within appropriate levels of security and privacy.

The information technology architecture is capable of supporting the necessary interconnections among state agencies and between government and other entities.

The state government workforce has appropriate tools and information to extend its capabilities for effective and efficient delivery of services.

Agency Strategic Plan for Information Technology

Management
- Strategy for executive involvement
- Strategy for selection and management of projects

Data Resources
- Strategy for information management and information sharing

Technology Infrastructure
- Description of the planned infrastructure (including networking and computing environment)

Human Resources
- Strategy for providing the workforce with information resources and tools
- Strategy for organizing the information services function

Agency Information Technology Tactical Plan (Resource Allocation Level)

Agency Goals and Objectives for Information Technology

Planned Changes to the Data Infrastructure

Application System Plan

Planned Changes to the Technology Infrastructure

Human Resource Plans

Major Project Plans

Security and Disaster Recovery Plans

Facility Plans

Expenditure Plans

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DESCRIPTION OF THE DISTRIBUTED MODEL

Excel model

Components of the Resource Requirement Model

PROGRAM DEFINITION

This worksheet is used to identify all programs offered by the department and to identify requirements for these programs.

PROGRAM PERSONNEL STAFFING MATRIX

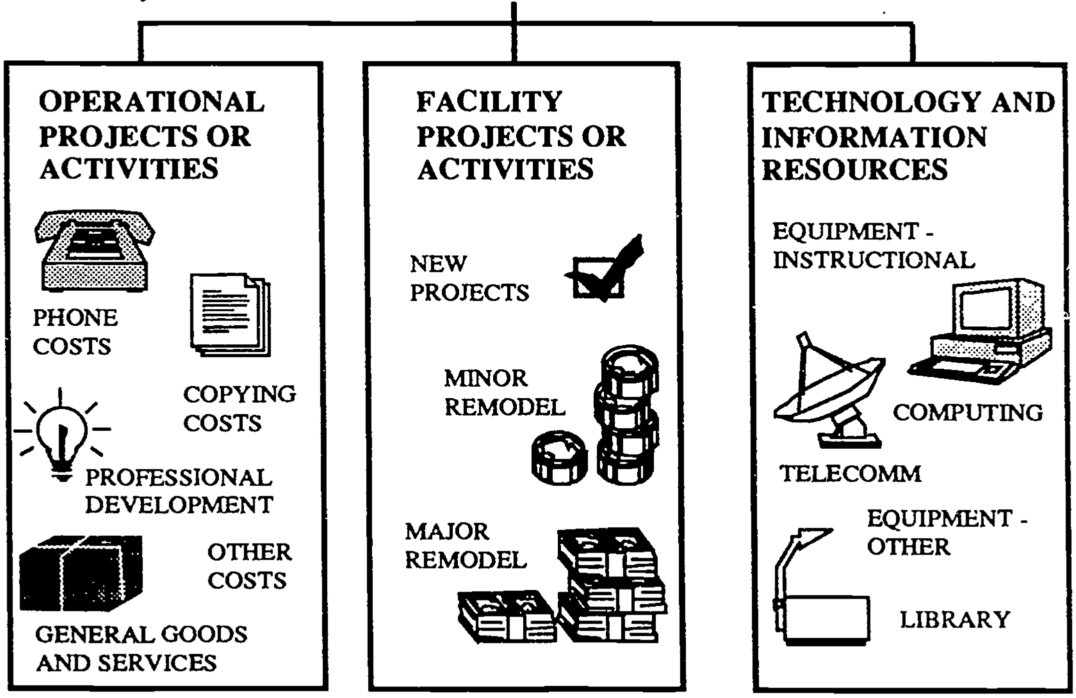
This worksheet is used to identify each person's role in all programs identified in the Program Definition worksheet. One Staffing Matrix is completed for each fiscal year.

FINAL RESOURCE ALLOCATION PROJECTIONS

This is a summary worksheet that identifies FTES/FTEF formula driven allocations and allocations entered on one or more of the exceptional resource allocation worksheets.

EXCEPTION RESOURCE ALLOCATIONS

The exception resource allocation worksheets are used to itemize exceptional resources required for department programs. Any or all of the three exception resource allocation worksheets can be used by a department. Entries from these worksheets are automatically totaled in the Final Resource Allocation Projections worksheet the next time the Final Allocation worksheet is recalculated.



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The resource requirements model is composed of six different Microsoft Excel worksheets which are used by department managers to allocate resources for the department over the six years of the planning period. Although department budgeting and planning could be completed using paper worksheets, the resource requirements model is far superior due to its speed and accuracy; this is particularly true when managers wish to evaluate resource requirements of alternative strategies. The model is composed of six worksheets. These allow the department manager to identify annual budgetary requirements in each of the following areas :

1. Department programs (or functions) and their components;
2. Personnel requirements;
3. Operations exceptions (non-personnel requirements);
4. Facility requirements;
5. Technology and information resources requirements; and
6. Resource allocation projections (summation of inputs from #1-#5).

Two different resource requirement scenarios were developed by each department. The first, the 100% of baseline scenario, assuming that the same amount of funding they had the previous fiscal period would be available and the second scenario, the 1XX% of baseline scenario, assuming that funding above the baseline would be available.

EVALUATION OF THE FIRST ITERATION OF THE SYSTEM AND PROCESS

Process

Without question, the single most important factor to the successful implementation of this process was the support of the university's president and provost and their commitment to involving departmental managers in the entire development process from the outset. This point cannot be emphasized too strongly for universities considering implementation of a similar process.

It should also be recognized that this type of heavily participatory process requires a substantial amount of time and will not be successful unless it truly becomes a management priority which supersedes (at times) all of the other activities for which managers are accountable. The process is not one which can be started and finished in three months; it will require anywhere from twelve to eighteen months to complete the first cycle of the process due to the training and learning curves associated with the process.

Model

Probably the most obvious and important lesson in utilizing a computer model to assist in a planning/budgeting process is the need for matching user skills with the model's degree of sophistication. The balance that must be achieved is securing the amount and type of information necessary for decision-makers to make informed programmatic choices on the one hand while keeping the model from becoming so elaborate and complex that managers are unable to use it.

While the model enabled mangers at all levels of the organization far more accurate and sophisticated analysis of data, it required some basic understanding of micro-computer usage which was lacking in some cases. The result was that those managers who were unfamiliar with micro-computers had to develop their information by hand on hard copy and then have it keyed into the model. Managers who adopted this approach often did not use the model to do the "if.., then.." type of analysis available to them through the model.

One of the difficulties of using this particular computer based model had to do with the limitations associated with using a two dimensional spreadsheet package rather than a more sophisticated package such as relational database software. The problem once again, however, was the development time frame—which was very short—and user skill level. While the spreadsheet allowed adequate analysis at the departmental level, as departmental plans were rolled up to division, vice presidential, and university levels, it could only be used in a limited manner. To address this problem, the university will be using PC Express to evaluate the data at the aggregated levels later in the process.

Where we go from here

In the spring of 1991, the president will present the final plans to the university's Board of Trustees for adoption. The budgets developed in conjunction with the plans will be adopted by the Board shortly thereafter. These two actions will signify completion of the first cycle of the university's planning process. From that point on, every year prior to the start of a new biennium, the plans and budgets will be revisited and adjusted, ensuring that programmatic and budgetary decisions are consistent with the goals the university has chosen to pursue.

CONCLUSION

Attempting to integrate the various planning and budgeting processes that normally are found on a university campus is a challenging and often, very difficult undertaking. At Eastern Washington University, strong leadership on the part of the university's president and provost and a micro-computer based model have enabled the organization to take a giant step forward toward realizing that goal.

The model placed a fairly sophisticated analytic tool in the hands of the departmental planners with which alternative strategies could be evaluated over a multi-year time frame. More importantly, by identifying and prioritizing budgetary allocations needed to support programs, the model required managers to make the same types of choices and decisions required in the budget process, thereby avoiding the most common pitfall of efforts to link planning and budgeting processes; that of failing to make difficult choices in the planning process, and then being forced to abandon the plans when the budget process requires such decisions.

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Turning a Private Label Credit Card into a Multi-Function ID Card

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ABSTRACT

Florida State University has implemented a card system that combines the best features of debit and ID card systems with the versatility of a private label bank card. An advantage of the approach is that all financial processing is done remotely at a bank charge card center. The VisaNet system provides the communications backbone, enabling standard credit card readers to be used, and cash withdrawals from bank ATM's throughout Florida. The system is flexible enough to handle standard debit transactions, enable data to be extracted from self inquiry terminals, support cashless vending transactions, provide an emergency notification system, and serve as a complete University billing system. The system, known as Seminole ACCESS, was pilot tested on over 8,000 students during the Fall 1990 semester. A variety of new and existing technologies have been successfully merged in the development of this system.

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Turning a Private Label Credit Card into a Multi-Function ID Card

Thomas G. James & Bill R. Norwood
Florida State University

Introduction

The campus debit card system, in some circles, was the "in" system to install during the last decade. Many forward-thinking institutions, out of a desire to improve the business side of their campus auxiliary units, implemented debit card operations that have been very successful. For a variety of reasons Florida State University (FSU) was not among those institutions that chose to move into the debit card arena in a big way. This is not to say, however, that we have not been trying; for we have been evaluating alternatives to our University photo ID since about 1984 and a Vali-Dine card system has been used for meal plans for several years.

We'd like to say that we were incredibly in touch with the technological trends shaping the debit card industry and that we were waiting for the precise moment to make our move. However, our basic motivation for waiting and studying, and waiting some more, was a lack of money. Although we will admit that after all of the committee work was done, our concept of what a card system should do for financial transaction processing had not been implemented in any existing campus card system that we knew of.

Let's begin by listing some of the issues we felt were not adequately addressed by turn-key campus debit card systems, circa 1987. First, there was a requirement for additional hardware, software, and communication interfaces. Second, our existing administrative terminals, which were operating in a coaxial 3270 SNA environment, could not directly access the debit card system. Third, we anticipated substantial local staff involvement, initially and on a continuing basis, from both the information systems and financial units of the University. And fourth, existing systems were restricted to on-campus use and could not, for example, take advantage of the vast financial networks that exist in our community and state.

No doubt many will feel that these issues are not insurmountable obstacles, and we agree. However, what was evolving on our campus was a much bigger concept for a card system. At the root of our search was the desire to consolidate into a single system all of the financial transactions between a student and the University, as well as those non-financial transactions typical of photo ID usage. If a student chose to, essentially all goods and services on campus could be purchased or accessed with a University-issued card, and the student would receive a single monthly statement of account activity. Thus, FSU wanted a card system that could 1) replace the existing photo ID, 2) be used on or off campus, 3) generate a single consolidated monthly statement, and 4) directly interface into the University's financial systems.

Our search for the ultimate card system led us to examine the benefits of using the services of a bank credit card processing center. As described in our presentation at CUMREC'90, we were able to evaluate the various processes by contracting with a bank card center to provide a billing system for the student long distance service offered by the Office of Telecommunications (OTC).

We were able to assess, for example, the following:

1) establishing accounts for students
2) generating and distributing cards
3) generating monthly bills for multiple merchants
4) collecting funds remotely at the bank card center and posting funds to University accounts
5) establishing on-line terminal access to the bank card center host
6) establishing internal control procedures using bank card center reports and control totals generated when data is prepared and transmitted from the University

Debit Card Pilot Project

When we left Buffalo last May, after presenting our paper to CUMREC'90, we did not know if the idea of implementing a debit card system would be accepted by University administration. We can truthfully say that taking what had been learned in the OTC pilot and turning it into a full-blown debit card system was only a dream of a few people at FSU. We fully expected it would take another year of discussions to move the project ahead, even though the pilot with long distance resale had been successful.

Thus, you can imagine our shock when the concept was supported by the Vice President for Finance and Administration and we were given an opportunity to address our proposal to the University Executive Council. In a matter of days, the President endorsed the idea, appointed a steering committee and a project director, and established a $100,000 line of credit through our Auxiliary Service Board. But that was just the beginning. In a matter of a few more days, the Steering Committee had decided that a debit card pilot project would be developed and in place for the Fall 1990 orientation program, a mere 3 weeks away, and that it would be called the Seminole ACCESS card. Naturally, some of us implored the steering committee to slow down, pointing out that monumental problems could develop if all the details weren't sorted out properly. Our pleading, however, fell on deaf ears; the decision had been made.

The pilot project which we implemented in August involved the following decisions and issues:

Selecting the Target Population

We chose to issue Seminole ACCESS cards to all new students, both freshman and transfer, attending FSU during the Fall 1990 semester, as well as all students who lived in campus residence halls. There were several reasons for selecting these groups. Because all students receiving the card were charged a $5.00 fee, whether they were going to deposit money in their account and use the debit card feature or not, the ACCESS Steering Committee felt that new students might be more receptive to the idea than existing students. All dorm students were included because they had previously been issued a card as part of the long distance resale billing project the prior year, and in order to continue the long distance resale billing system with the new debit card, all such students had to receive a new card.

The total population selected to receive the Seminole ACCESS card was over 8,600 students. Of that total, 2,109 chose to deposit money into their ACCESS account.

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Determining Services to Offer

Since the ACCESS card was to become a reality in just a few short weeks, we needed to make quick decisions related to what services should be offered. Because our concept of a universal card implied more than simply a debit card service, we felt compelled to expand the initial offering. Thus, access to the on-campus bank ATM, emergency notification, telecommunications billing services, and a self-inquiry terminal system were made a part of our pilot.

We met individually with all of the offices concerned, and on August 19, 1990, just 12 weeks after project approval, students were depositing funds and using their ACCESS card at over twenty different locations, both on and off campus. Off campus locations were restricted initially to two adjacent bookstores and the gift shop operated by our booster organization.

Developing a Marketing Strategy

Big advertising campaigns and TV spots were high on our list; our wish list that is. Actually, we ended up with a very targeted marketing campaign based on no budget and no lead time. Marketing included: 1) a simple letter to new students and parents just prior to their arrival for summer orientation, 2) group presentations at orientation sessions with parents and students, and 3) buttons and T-shirts worn by orientation leaders and staff at the Seminole ACCESS Center asking "Do You Have ACCESS ???".

The marketing strategy was to explain where the ACCESS card could be used, emphasizing ease of use, the safety inherent in not carrying cash, access to cash in ATMs, a monthly detailed statement of account activity, the emergency notification system, and the personal attention shown at the ACCESS Center. Most students and parents were pleased with the idea of the ACCESS card program and felt that it would be a useful service.

Establishing the ACCESS Center

If one is to have a program like Seminole ACCESS office space is needed, and it is unsettling to be looking for office space that will create a professional image, and be centrally located to the resident student population, knowing that the doors must be open in a matter of weeks! Our problem was partially solved when we located a recently vacated storefront at our University Union complex. Since we were operating on a limited budget, how could we afford to rent office space? What about counters, computers, terminals, telephones? What about staff? Because of the many people anxious to see the ACCESS card succeed, the space, staff, and necessary equipment were made available in time to open the doors for the orientation sessions beginning in June.

Converting Long-Distance Resale System

After participating in the initial pilot of the billing system with the charge card center, our Director of Telecommunications decided to install a new system (BITEK) for long distance resale that provided several enhanced functions. The BITEK system would support, for example, a student deposit, and because it included a computer that communicated directly with the switch, student services could be terminated automatically when charges exceeded the deposit. The new system was a turn-key system, capable of handling all of the long distance billing functions on its own. Our goal was to 1) have BITEK staff modify their system to transfer data to and receive data from our local cashiering system as an interface to the charge card system, and 2) make changes in our

cashiering system to produce files that would be downloaded to BITEK, as well as various supporting reports.

After several false starts, we were successful in developing an interface to provide data on payments and deposits to the BITEK system so that it could activate and deactivate telephone service automatically.

Determining Merchant Agreement and Discount Rates

Naturally, determining who should pay and how much was a hotly debated subject. Discount rates charged to merchants that accept the ACCESS card are adjusted every three months based on the average sales price. The relationship between average sales price and discount rate is inverse. Thus, merchants with small average sales prices are charged higher discount rates than merchants with high average sales prices. Discounts range from 1.5% to 5% for campus merchants. Off campus merchants that accept the ACCESS card will be charged a discount rate 1 percentage point higher than on campus merchants.

A critical pilot project task was the development of a merchant agreement that describes the responsibilities and obligations of the merchant and the University. Credit card Industry standard guidelines were followed but the agreement was tailored somewhat for the campus environment.

Developing Local System Interfaces

Our policy regarding the development of local system interfaces is very simple. Any financial transactions that are to be posted to ACCESS card accounts must be generated by one of the following; 1) ZON Jr. type readers operating through VisaNet in support of merchant sales activity, 2) charge transactions created from a batch system such as BITEK which are submitted (uploaded) to the charge card center through their cash letter processing unit, or 3) the University's cashiering system from student deposits or payments.

Our intention was to force all activity through these three control points, eliminating the on-line posting of deposits or payments directly to the charge card center. With financial updating restricted, audit trails would exist in the University cashiering system or the charge center's cash letter system. Because of this approach, our local system interfaces were greatly simplified, and additional application interfaces could be added to the University cashiering system as needed.

Seminole Access System Description

Now that some background and an overview of the pilot project have been presented, let's examine the Seminole ACCESS System more closely.

In-House System Enhancements

Crossover Table - Interfaces for administrative applications residing at our administrative computing center were required. Access to student or financial records using the ACCESS card account number from the ABA coded magnetic stripe were not possible directly since most University records used social security number as a key. Thus, a crossover table was built to allow applications to use either social security number or ACCESS card number to locate records.

Having built the crossover table, access to data from terminals with attached credit card readers was enabled. Self inquiry terminals at various locations throughout campus allow students with ACCESS cards to read and print course and fee information. In the

near future, this service will be expanded to allow students update access to our central address file. Concerns over security have been reduced since data is not accessed by entering social security numbers. One now needs an ACCESS card and a personal identification number (PIN) to use most self inquiry terminals on campus.

Cashiering System - The FSU cashiering system was developed locally in CICS for use with 3270 type terminals operating on host based data files in 1987. This system was enhanced to be the control point for financial transactions related to the ACCESS card. All deposits or payments flow through this system.

This system was modified to create transactions for downloading to the BITEK system in support of long distance resale. Thus, when deposits for the activation of long distance service or payments on the previous months charges are posted into the cashiering system, a separate transaction file is generated. Office of Telecommunications personnel then use a new CICS applications to further prepare this file for downloading. At appropriate intervals the file is transmitted to the BITEK system to update its internal files.

Another local interface involved the addition of a billing address to the University centralized address file. The address file, together with any applications that needed to access this new address were modified.

Charge Card Center Operations

On-Line Access - Once transactions generated in the cashiering system are transmitted to the charge card center, individual accounts can be updated through batch or on-line processing. On-line updates are processed directly at the bank center in Tampa, Florida. Since our cashiering system controls financial transactions, direct on-line account activity is limited to general maintenance functions such as requesting a new card, adding a new account, requesting a PIN number for ATM use, or updating statement addresses.

Reports - Printed reports are produced daily at the bank center and delivered to the First Florida Bank in Tallahassee. A wide range of reports are available, including those used for account activity verification and review, merchant reporting, over-limit and late payment reports, audit trails and cash settlement reports. Microfilm copies of all reports are kept by the charge card center in the event of a lost report.

Lost/Stolen Cards - One of the most important operational issues we faced was how to handle lost or stolen ACCESS Cards. In a normal University environment, lost or stolen picture ID cards are not a serious problem. In our case, the fact that students have money on deposit for use at over twenty-two different locations changed that situation. However, what was expected to be a difficult problem was one of the easiest to solve because the bank already has a system in place to handle such situations.

In the case of a lost or stolen ACCESS card, the student is instructed to call a 1-800 number. This number is active twenty-four hours a day, seven days a week. When reported, the operator will ask for pertinent information, such as when was it lost, and the last time it was used. This information is electronically passed to the charge card center and within a matter of a few minutes, the account is immediately deactivated.

To reduce losses associated with fraud, transactions coming into the system after the card is reported as lost are monitored. When a possible fraudulent transaction enters the system, the bank center calls the card holder to determine if they made the purchase in question. If they indicate they did not, the transaction is considered fraud, noted, and not billed to the customer.

Collections - Collection processing is important for two reasons. First, it is possible for a student to issue the ACCESS Center a bad check and then remove or spend most of

the funds. Second, Telecommunications is actually allowing a student to run up a credit balance for telephone services. Thus, should these situations result in a bad debt, the University has access to the collections system used by the bank. This system will allow collectors (bank employees) to work through prompted screens bringing up accounts that are in various stages of delinquency review calls and send letters automatically.

By consolidating the financial transactions between the University and the student into a single system, we can make much better use of non-payment information. The ACCESS card system makes it much easier to place financial stops on students that owe the University money.

Merchant Authorization - Perhaps one of the most intriguing parts of the system is sales, or authorization, processing. When a purchase is made at the University Bookstore on campus, the ACCESS card is swiped through a credit card reader. The credit card reader then routes the account number, amount of the sale and a merchant identifier to VisaNet. VisaNet determines the card processor, in our case First Florida Bank Charge Card Center in Tampa, and routes the transaction accordingly. The STRATUS computer at the card center reviews the "buy line" of the account and, if sufficient, reduces it by the amount of the purchase. Concurrently, a record is made of the authorization. When this is completed, an authorization code is added to the transaction and routed back to VisaNet, which then routes the transaction with the authorization code back to the University Bookstore.

Should VisaNet fail, transactions will be routed to the National Data Center (NDC) in Atlanta which will route them to Tampa. If STRATUS in Tampa is down, ACCESS transactions cannot be processed. Since we are dealing with a debit card, no credit purchases can be authorized. We are discussing, however, setting default parameters at NDC to allow students to spend up to twenty-five dollars in the event the system is down. This would allow, for example, a student expecting to use the ACCESS card for breakfast to do so when the system was not available. ATMs have separate default parameters and are expected to remain at zero.

Emergency Notification - An additional feature worth mentioning is emergency notification. In the event of an emergency, the bank center, upon notification, will flag the student's account in the STRATUS system. Subsequently, when the student uses the ACCESS card, a "call" message will be routed to the appropriate credit card reader. In our case the student will be instructed to call the FSU Campus Security Office for a message.

Fund movement - To move funds from various accounts, the charge card center uses a system known as the Settlement system. The Settlement system receives detailed transaction (sales) data from NDC daily. Included with the sales information from merchants are cash letters covering how much money is due to be transferred to merchants for their daily sales activity.

In our case, we are allowing the charge card center to move funds directly from various accounts as indicated by the Settlement system. Funds deposited by students are placed in an agency account at a local bank. Funds are then transferred from this account and deposited either to another FSU auxiliary account or to another bank.

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ACCESS Card Benefits

We believe the entire campus will benefit by using the Seminole ACCESS card. Students are now able to pay for most campus services with one common card, reducing the need for checks, cash, and credit cards. This also leads to a cashless environment that promotes safety and may reduce thefts. Students also receive a detailed statement showing all of the uses of their card. Parents will be able to relax knowing that the check they sent has been deposited and they can see where their money was used. Funds are available to use sooner than through a normal checking account. Parents know that in the event of a family crisis, the emergency notification system is available to help locate their son or daughter.

Departments can also reap benefits from the ACCESS card. FSU has received numerous audit criticisms for the 80+ cash collection points scattered across the campus. Most of these departments are too small to have the necessary separation of duties required to satisfy an auditor. In some cases, one person handles billing, collecting, and balancing. Thus, departments in which these conditions exist can now meet audit criticisms by using the ACCESS card. All collections from students at the department level can be handled through credit card readers. When cash and checks are not accepted, audit criticisms are eliminated. An additional benefit is that staffing requirements and workload are also reduced. The equipment needed to support departmental collections consists of a standard credit card reader and attached printer.

Academic and auxiliary departments are now able to charge student accounts for services, lab breakage, losses, etc., without collecting cash or completing various forms to be sent to the Cashiers office. The Controller's Office now has fewer cash collection points to worry about and charges are posted to student accounts immediately.

Certainly, one of the hardest problems to deal with at any University is the collection of tuition. At FSU this means hiring approximately 50 temporary workers for a week; moving thirty or more computer terminals to a central location; and having 30,000 students line up over a five day period to pay fees.

Plans are now being developed to allow students to authorize tuition and fee payments from their ACCESS account while using the telephone registration system. If all goes as expected, students will not have to go to a central point to pay fees, which will save the University money and be very convenient for students.

Funding Methodology: Who Pays?

In order to properly consider this topic, one must recognize that campus operations can be categorized into two types: those that generate revenue to pay processing costs, and those that only generate costs. We refer to these as revenue generating and non-revenue generating operations, respectively.

Revenue Operations

Revenue operations are those where goods or services are purchased. These operations include fast food outlets, cable TV and long distance telephone services, bookstore sales, computer store sales, ticket sales, etc. These are the areas where we expect to recover the cost of the ACCESS card system through the use of a "discount rate." If a merchant accepts Mastercard or any other type of bank card as a means of payment, a percentage, or discount rate, of the sales ticket is paid for processing. Funds generated from revenue generating operations should pay for their operational costs, but they should not pay excessive discount rates in order to subsidize non-revenue operations.

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Non-Revenue Operations

If the costs associated with non-revenue operations are not recognized and accommodated, then funding the ACCESS card becomes difficult. By non-revenue, we mean any operation that uses the ACCESS card for other than financial processing purposes such as taking class attendance, authorizing admittance to University functions or participation in intramural athletic programs, or determining the current status of a student. These operations generate costs, and since every student, faculty, and staff member will eventually be required to have an ACCESS card, non-revenue uses of the card will increase. Thus, base funding requirements for the ACCESS card must cover the added costs of the non-revenue generating operations.

At the present time, we are using the $100,000 auxiliary credit line to fund ACCESS card costs related to non-revenue operations. However, many of the processing functions of non-revenue operations can be done without incurring additional transaction processing costs at the bank card center. For example, data can be downloaded from the bank card center to personal computers for use in access or student verification applications su·h as athletic ticket sales or class attendance checking. While there are opportunities t. avoid costs in handling non-revenue operations, there are costs associated with these functions the University must be willing to accept.

Discount Rates

Since Florida State University is the "issuer" of the ACCESS card the University determined the discount rate, as well as where the ACCESS card may be used. During this analysis, it was determined that the discount rate table had to be a sliding scale based on the average ticket sold by a merchant. The rate was based strictly on the per transaction cost associated with processing sales transactions from merchants. A merchant can expect to pay a discount rate of as little as 2% or as high as 6% on ACCESS card transactions.

Conclusion

The ACCESS card pilot at Florida State University which was based on the concept of a private label bank card was successful. We have attempted to maximize use of the card on campus, and we have made available the state-wide network of MAX ATMs. Students may withdraw cash at any of 250+ locations using their ACCESS card and PIN number. This is a critical factor in the success of the operation. Without access to cash, a student would not be as likely to leave funds on deposit in their ACCESS account.

Initial projections indicated deposits would total approximately $250,000 after the first three months of the project. Actual deposits totaled over $1,100,000 for this period, with merchants receiving over $530,000 dollars in sales. Thus, deposits were almost 400% greater than expected. Students have utilized the MAX ATM network for cash withdrawals amounting to $250,000, and the ACCESS account currently has a deposit balance of over $220,000.

Due to the increased level of deposits, we have also generated more income from sales. This has amounted to approximately $11,000, with $10,000 coming from the merchant discount rates. ATM withdrawals generated approximately $1,000 dollars in revenue.

At Florida State University, our campus card system solution is based on the merger of several technologies. The tools available in the private financial sector are powerful,

reasonable in cost, and waiting to be used. We are now in the process of merging the following technologies to further support and enhance our card system:

First Florida Bank Center will provide the backbone of the financial network for debit, ATM, hardware, software, and merchant support.

DATACARD Corporation will provide the technology for the new digitized photograph for the ACCESS card. This will include on-site card creation and encoding of the ABA encoded magnetic stripe, as well as storage of the digitized photo for future use in a variety of innovative applications.

DEBITEK Corporation brings the "cashless transaction" environment to the ACCESS card for all vending operations. This is a key part of the FSU solution because it allows us to avoid the transaction cost of the banking system for handling small ticket cperations for which a discount rate would be prohibitive. Even more importantly, it gives us a vehicle that can also be used in off-campus privately operated businesses such as local copy services immediately adjacent to the campus.

TELZON Corporation enables hand-held magnetic stripe readers to be used to check attendance in large lecture classes, or check participants in intramural activities to determine if they are currently enrolled.

BITEK Corporation is usually a self-contained monitoring, billing, collection, and accounting system for various services such as long distance resale, cable TV, etc. Because of the single bill concept, interfaces to our cashiering system have been written allowing full integration of the two systems. Financial functions are handled outside of the BITEK system, but the BITEK system feeds charges to ACCESS, and is in turn fed information to automate the activation and deactivation of services.

Our goal is to apply these technologies, and the concepts behind them, to develop a universal card system. At Florida State University the Seminole ACCESS card truly integrates financial processing, and redefines the meaning of access to University services.

Keys to Success for Senior Level Computer Managers

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Attributes for good executives are outlined in detail. The vision you must have to change the organization must be a high priority of your job. The professional credentials that are required to do your job and how you are able to establish your professionalism in a higher education setting are discussed. The management ability you must have including, people skills, types of supervision, and the relationship to power both personal and organizational are reviewed. The executives role in establishing a good management team are considered. Finally, attention is given to critical components of managing and controlling change within the organization.

Introduction

In this review of the characteristics, skills, and attributes required of the computer and information managers in higher education, the starting point is to examine the credentials of these professionals as well as the historical development of the position in higher education.

Origins

Not unlike the emergence of librarians, bursars, and registrars from the ranks of the faculty in the colonial colleges of America, faculty were the first managers of computing resources on college and university campuses. Indeed, the early computer scientists and mathematicians were pressed into service on a part-time basis to assist with the basic data processing that the business office required to conduct the transactions of the institution. However, as the complexity of the data processing increased the position became permanent. Soon the need to provide services in support of research and instruction became part of the service requirement. This expansion was often met by creating separate academic computing centers. Today we have instances of campuses with combined centers as well as those with separate facilities. Reporting lines are equally complex with the majority of facilities still reporting to a finance or administrative officer. Indeed this early association with administrative functions rather than academic endeavors may have been the main reason that the computer or IS manager rarely enjoys faculty status like his colleague in the library. This comparison with library director will be revisited later since there is similarity in the provision of academic services provided by these professionals. Turning from the past to the present, who is performing the task of computer and IS management on our campuses? What type of academic credentials are needed? How important is professional certification?

Charles H. Warlick of the University of Texas provides the most comprehensive body of information about the IS manager in higher education through his editing of the annual Directory of Computing Facilities in Higher Education and the companion Salary Survey - Academic Computer Facility Directors. In the 1990 edition, Warlick profiles the average computing facilities director as being forty seven years old, with six years of service as director, and having earned their last degree fifteen years ago. The types of degrees are varied with just less than half of the highest degrees earned by directors being in computer science, mathematics and the physical sciences. Business degrees were numerous but still less than the combination of other types of degrees earned. This diversity of academic background may be viewed as a positive or negative factor in evaluating the credentials of the IS professional. Can "anyone" become a computer center director and if so is that a good thing?

Perhaps it would be useful to return to the comparison of IS professionals and their colleagues in the library. A library director is usually expected to have very specific academic credentials. A masters degree in library science (MLS) from a school accredited by the American Library Association is usually a prerequisite for employment. Does the lack of similar academic credential disadvantage the IS professional or does the diversity of educational background provide higher education with a better prepared pool of professionals to manage IS facilities? This question may be tested as the convergence of computing and library services continues as information services are reshaped on campuses.

Professional accreditation may be one way of off setting the lack of specific academic credentials. However, a closer look would suggest otherwise. Certainly there are professional societies that serve the IS professional. The Association of Computing Machinery (ACM), and the Computer Society of the Institute of Electrical Engineers (IEEE-CS) are primary among IS professionals in higher education. The Data Processing Managers Association (DPMA) also has impact but still seems to be dominated by members from the private sector. These organizations invite membership without specific qualifications and are complimented by other voluntary organizations like CAUSE.

However, there is an accreditation program which is administered by the Institute for Certification of Computer Professions (ICCP) which has been formed by eleven professional societies including the three previously cited. This certification process is done by a combination of testing, job experience and/or academic training. The three designations offered are: Certified Data Processor (CDP); Certified Systems Professional (CSP); and the Certified Computer Programmer (CCP). Despite this established method of certification and recertification, it would not appear that much attention is given to such certification in the recruitment of IS professionals in higher education. At least, it would not appear so by the review of position announcements.

This paper offers no specific position on the question of certification but simply reviews the current situation to show what professional credentials the IS manager can point to and how they compare with their academic colleagues.

Academic Colleagues

The continually developing maturation process of information technology on our campuses has not provided a shortage of those who are willing to play a part in providing services or formulating related policies. Certainly, IS managers cannot assume that information technology is solely their domain. Others are playing a part and will continue to vie for resources and responsibilities.

Faculty, particularly those in the computational and quantitative sciences have long been an alternate source of expertise to support or contest the level of services and expertise offered by the IS manager. It would not be far fetched to suggest that many campuses may have found their Computer Science department and computer center to be out of synch from time to time. As stated earlier many IS professionals may have come from the faculty. However, many would attest that the perception of them by former faculty colleagues can change. This situation has been expanded to include faculty from many different disciplines who were quick to adopt the personal computer as a teaching or research tool and have not only mastered it but may be able to develop a greater body of computing expertise within the narrow focus of their discipline.

Library directors have begun to emerge as strong competitors for resources and responsibilities in the provision of information services. It should also be noted that equipped with strong academic credentials, frequently accompanied by faculty status, they may be formidable allies or powerful rivals. The convergence of computing and library services through electronic information exchange will provide a sharp focus on the relationship between the Library director and the IS manager.

In addition to these more traditional academic colleagues, the latter part of the 1980's has seen the emergence, or at least the partial emergence, of the Chief Information Officer (CIO) even if many carry out the coordinating of information and technology related services and policies under a different title. A CAUSE professional paper recently provided a comprehensive review of this phenomenon. The Chief Information Officer in Higher Education; Penrod, Dolence, and Douglas; CAUSE Professional Paper Series, #4.

Finally, we should not overlook the student body. Their perception of the IS manager has traditionally been one of a service provider, a gate keeper, a part of the administration. The more technologically advanced student may have more elaborate expectations and provide new challenges for those charged with managing, securing, and main aining information and computing services. While it may be unnecessarily paranoid to think of a campus, nation, or world full of hackers with the primary objective of illicitly accessing data or computing resources you have been charged with protecting. It is quite clear that networking and related security measures are more critical now than ever before.

So what does this mean to the IS professional. First and foremost it means that it is more important than ever to act in a professional manner and to be sure to remember that there will be a need to accentuate all aspects of professionalism among their management team and staff, if they are to continue to play a leading role in the provision of services and the establishment of appropriate policies and procedures. In other words it may not

continue to be business as usual or things that were held to be self evident in the past, may be under new examination. The remainder of this paper deals with how the IS professional can best use professional tools to deal with the challenges of today.

Vision

In today's environment, Information System Managers must be seeking new ways to do business. "If it runs, don't change it," isn't good enough anymore. The manager that does not create the environment for change may be a liability to the organization.

Today's Information Systems (IS) Manager must keep up with the trends in today's technology. He must know the way his institution conducts their business and have the vision on how to transform the way they do business. A good manager must also find new ways to turn out effective managerial information systems.

If the IS Manager does not have vision, then someone else in the organization may have this, or he can visit other institutions to gain this critical information. Today's top Information System Manager must become directly involved in the planning and implementation strategy for strategic systems. Keeping up with technology is critical to the success of information systems.

Choosing what is Important

Picking a strategic system is the most important function we can play. A university has many goals and objectives, and the systems we implement are a means to an end, namely to achieve these goals. Picking the right system is sometimes known as a critical success factor. Hence, the projects we select are essential in the support of achieving these goals. The system we choose must be visible from the top yet support the operational functions that run an institution. If the system we pick is not visible from the top, then we may have a hard time explaining what we accomplished for the year.

A good example of a strategic system or subsystem might be automating student refunds, thus producing faster turnaround for student refunds or telephone registration, thus reducing long lines for registration. Both are very visible from top and bottom.

Do we slice off a piece or phase in the project? Many projects go down the drain due to two or three year target dates with nothing visible to the user; hence, a loss of confidence in the computing organization. It is always best to design from the top down and build from the bottom up whenever possible. Thus, picking a piece or a phase when the user can visibly see some tangible output is important.

Once we pick a project and get the go ahead, then matching

the right resources to the job is essential. This requires an understanding by management of picking the right people to get the job done. Do we place three "drivers" on the project, who will fight each other for control, or three "amiables", who must be stroked each day before they can work. Do we control the "enthusiast", who starts everything but finishes nothing? Matching the right resources to do the project is a skill we rarely give much thought, yet it is a critical factor to the successful completion of the project.

Do we get the job done or study the project forever? You can study the project for six months and program for six months for 95 percent of the goal or you can study the project for three months and program for six months to support 90 percent of the goal. Defining the project may never end. One must make a reasonable decision to proceed after lengthy discussions with the user in defining the system.

Cross Organizational Issues

When we get to the roadblocks, do we address the cross organizational issue or hope our subordinates can hit their heads against the wall until it cracks. It is the Information Systems Manager who is responsible for compromise and solutions.

Do we stand up for our staff, fight for our beliefs or back down and let others make our decisions. It is up to us to sell ourselves and our ideas. This comes about through doing what we say we are going to do and meeting our deadlines and obligations.

Acting as a Change Agent

A crumpled piece of paper with letters clipped from newspapers and magazines spelled out the following message in a prominent advertisement:

We have the information, and getting it back will cost you!

We may laugh at this portrayal of the world of computing, and yet, are we still perceived this way by the people we are trying to serve? If we are not good change agents, the answer to this question may be "Yes" in all too many cases.

Are we good change agents? If we look at current articles and our speeches and casual conversation we seem fairly convinced that we are not good change agents. We are the ones who know the technology, who struggle to keep up with it and who continue to try to educate other people. However, we are also the ones who continue to discuss how the people we try to change keep resisting. They don't want to change. Perhaps the problem still sits with us.

Good change agents must focus on the needs of their institutions. Yet, where is our focus? We have services to

maintain and build and more than likely we are still highly focused on the technology itself, not on the problems of our colleges and universities. We can test ourselves by looking at what we read, who we talk with, and what we talk about.

- Are we limited to Computerworld, Datamation, Supercomputing, MacUser and the computing section of the Chronicle of Higher Education?
- Are we spending most of our time with other technology oriented people?
- Are our conversations about upgrades, capacity problems, project development deadlines, and the merits of one computer manufacturer versus another?

If so, how well do we understand the people we are trying to serve? How can we have a balanced overview of their needs and those of the institution itself? How can we say we have the right answers when its possible we are not even addressing the right problems? Is it any wonder that we find it difficult to make the changes we feel are necessary and to get the funding to make those changes?

Good change agents must be willing to change themselves. In this regard, we, as computing professionals, are as resistant to change as anyone else. Cutting someone else's budget to fund out technology is okay, but cutting the central computing budget (assuming you are in central computing or networking) to fund departmental machines or local area networks is a different story. If we have a negative reaction, it is based upon knowledge of the institutional problems and proper application of technology or is it based upon loss of control, downsizing of our importance, or other personal feelings?

Good change agents must know themselves. We cannot start to change ourselves or our institutions until we are willing to really look at ourselves and know who we are and what we really have to offer. Most of us don't really know ourselves. We have developed some wonderful defenses that allow us to be comfortable enough and confident enough to function. Very few of us will drop all of our walls, but if we are still learning about ourselves, we are on the right track.

Good change agents listen. One of the ways we learn about ourselves, the problems of our institutions, and the problems of the people we are trying to serve is to listen. Much has been written about good listening skills and much of it is sound advice. It boils down to one thing: We cannot learn while we are the ones doing all of the talking, about ourselves and about our technologies.

Good change agents market themselves. On one hand, we cannot do all of the talking. On the other hand, we cannot afford to be

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silent, either. In tandem with listening to problems and knowing our worth in solving those problems, we must communicate that worth to our institutions. Information technologies may indeed be the keys to solving several of the major pressing issues for education. However, if we are not getting the messages out and being heard by the right people, those may not be seen and put to use.

Marketing is not just selling; it involves all of the attributes mentioned above. Marketing involves listening to the needs of the people we serve, understanding those needs, knowing what resources and skills we have to apply to meet those needs, changing our combined resources an skills if required, and then coming to an understanding or contract with our "clients" to deliver the necessary services.

Good change agents are leaders. A leader is proactive, not just reactive. As change agents we cannot afford to sit back and wait for problems to come to us. Enough of them do on their own, and we end up spending time solving them. But perhaps many of these problems are better left unsolved. A good change agent works to get an overview of what the right problems are and works to solve them. This is not easy because all problems cry for resolution.

Good change agents accept responsibility wisely. Problems related to computing, even large administrative systems, do not necessarily belong to computing centers. We do not have unlimited resources, therefore it is understandable to think that we can solve all problems. More importantly, computing centers should not own administrative systems. The users who are served by the systems are the rightful owners and must accept the responsibilities that come with it. The responsibility for choosing which problems to solve must sit with the college or university as a whole. Upper level computing managers who accept the wrong responsibilities without adequate resources are destined for trouble. Sometimes we can best lead by helping others accept responsibility.

Ability to Manage

The functions we are hired to do are no more than what we learned in Management 101; that is, we plan, organize, control and supervise.

The skills we need to do the job are still the same; namely, people, technical and administrative. Most of us are promoted with one or maybe two of these skills. What about our people skills? What type of a manager are you? In the decision process of planning, are you a participative manager or do you use benevolent participation? Do you listen but make the decisions no matter what your subordinates say? Do you make decisions, and are they timely? What style of leadership do you use? Do you use all four styles

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available; namely, do you tell people what to do, sell your subordinates on what and how they should do it, ask how they would do it, or just tell them to go do it.

Each one of these styles is important in getting the job done, and each style depends on the maturity level of the subordinate. As managers we must deliver on what we say we will do, if our users are to have confidence and respect for our ability to get the job done.

Executive Ability

The ability to work with others in the organization at your level and above is vital to the success of the Information Systems Manager. Do you make periodic visits to the Deans, Department Heads and Vice Presidents? Do you know your peers? Remember we make most of our decisions in an informal setting.

The ability to sell our plans and decisions is so dependent on our abilities to influence those above us.

Good executives admit their mistakes to their subordinates and are not afraid to correct their errors.

The ability to broaden your horizons and gain the ability to be a good executive can be helped by actively participating in a professional organization.

Conclusion

Good IS Managers make change the rule rather than the exception and spend 40 percent of their time on creativity and looking at the way the institution does its business. They hire good managers and keep the organization lean and flat. It is to their advantage not to keep employees in the organization that cannot produce. No one can afford it.

IS departments that survive the 90's are managed well. Where and to whom a department reports is minor compared to how they are managed. The reporting line of a department has very little to do with the department functions. Good managers make things happen.

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Levelling the Playing Field;

Ways to Set Priorities Among Competing Projects

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Abstract

In university administrative computing environments, the number of "urgent and essential" projects often far exceeds what the computer staff can design, program, and implement in a timely fashion. The problem is particularly acute when the backlog of such projects has grown significantly due to delays from an extended period of hardware conversion. Following a history of uneven and ad hoc approaches to allocating computing resources, a medium-size independent university is developing a more systematic, open, and fair method of evaluating, selecting, and setting priorities among such competing projects. This paper defines the problem, discuss the inadequacy of past approaches, and outline new methods which are being developed.

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Introduction

An ongoing challenge in most university administrative computing environments is that of balancing a seemingly unlimited demand for programming and system development with limited staffs of programmers and analysts. In the eyes of deans, directors, and other administrators relying upon computing to carry out their duties, their own particular projects are usually seen as "urgent and essential" needs which must--in the interest of the institution--move to the front of the queue and be addressed immediately.

Beyond the issue of which projects come first, the sheer number of projects in the queue also can be a cause for concern. Even if there is agreement on the order in which projects should be addressed, requested work can so far exceed the programming capacity that the end of the queue would move many years into the future if nothing were done to limit the number of projects. Consequently, there is a need to determine which projects will be done at all as well as to establish a priority order among accepted projects.

There are basically two approaches which can be used to control the volume and priority of computing requests. One is through a system of billing or "chargebacks." Charging for services imposes a form of marketplace control over computer utilization and the allocation of computing resources. If users are billed, only those who can afford the cost of programming or system development can get their projects in the queue; those with the largest budgets will typically be the first in line with the largest projects. Under such a system, however, there may be little relationship between whether a project is "affordable" and its actual importance in terms of broader institutional needs.

The second means of setting computing priorities is through a centralized process in which each proposed project is reviewed in light of computing resources and institutional goals as well as its importance relative to competing projects. Such decisions are sometimes placed solely in the hands of the administrator in charge of computing, but more often a committee is involved. The committee approach has two major advantages: (a) it provides broader input of both information and perspective into the decision process, and (b) it provides a greater degree of legitimacy for the process and thereby should lead to wider acceptance of the decisions.

This paper focuses on these two approaches to resource allocation in administrative computing. After a brief review of some of the recent literature on the subject, it will describe the problems in computing resource allocation experienced by one medium-size independent university and outline changes currently underway to address those problems.

Patterns in Setting Priorities

As many authors have noted, each institution's particular organizational structure for information technology should reflect the campus culture and traditions as well as the strategy it has chosen to achieve its goals (Barone 1987; Blackmun, Hunter, and Parker 1988; Dillman and Hicks 1990). Consequently, it often is futile to simply try to impose one institution's structure on another. Many of the same forces are acting upon different institutions, however, and each can learn from the experience of others. With no pretense of being exhaustive, the following paragraphs will illustrate the major themes under discussion by examining trends, weighing arguments, and looking at the experience of others in grappling with these issues.

Approaches to Computer Billing

Institutions of higher education fund campus computing in a variety of ways. At one end is the "library" model in which all computer costs are budgeted centrally and there are no chargebacks to users. At the other extreme is the "economic" model designed for full recovery of costs from the users. Between are a number of variations involving some central funding combined with a partial recovery of costs through billing users.

Discussions of billing for computing services often focus upon the issue as a problem of funding the cost of computing (Alley, Shaub and Willits 1987; Robinson 1988). As the same amount of institutional money usually is involved whether it goes directly to the computing budget or gets there by way of the departmental budgets of users, however, the issue really is one of allocation of resources. It is computer billing as a means of allocating computing resources and determining priorities among competing projects that is of interest in this paper.

Billing for use of computing resources has always been more common in administrative computing than in academic computing. The larger the institution, the more likely also it is to follow the chargeback approach. Billing was quite common in the 1970s, and a 1980 CAUSE survey found that between 1976 and 1980 there had been an increase in the percentage of institutions which were charging users for computer services (Thomas 1981).

In the 1980s, however, there has been a trend away from billing for administrative computer services. A 1984 survey of small institutions found that the prevailing pattern was not to charge users for computer resources, either on a real dollar or a cost accounting basis (Coughlin 1986). In the 1985 CAUSE survey of member institutions, only about 40% indicated that they billed for administrative computing costs, down from 60% in the 1980 survey (Thomas and van Hoesen 1986). Larger institutions were still more likely to charge, but even among large institutions the percentage not charging doubled to 33% over the five-year period whereas among medium-size independent institutions the percentage not charging went from 38% to 75%. Results from the 1990 CAUSE survey are not yet available, but there seems to be no indication of a reversal of this trend away from billing.

Advocates of the chargeback model as well as institutions which follow that approach usually are sensitive to adjustments which are needed to make it work. In arguing the merits of billing for computer resources, for example, Chachra and Heterick (1982) emphasize that if this approach is to be successful the charges must be realistic, equitable, and predictable. In describing an institution which made a recent decision to move from central funding to 100% cost recovery in the area of administrative system development, Bushnell and Heller (1989) note that the change was made in phases and was accompanied by the transfer of funds to the budgets of user departments based upon historical patterns of usage.

Some institutions have attempted to address the issue of chargebacks and priorities from a middle ground position. This involves establishing a basic level of computing service which is centrally funded and provided to the entire campus community with no individual department or program charges. Computer usage above this base level is considered to be incremental and discretionary and the individuals or departments are charged for such services. In describing this approach, Orcutt (1986) notes that in addition to providing an equitable means of controlling the level of usage, this approach stimulates a comprehensive and strategic approach to the use of computing and helps create an awareness of what a university expects from computing and what limits it might wish to enforce.

But as noted above, more and more institutions are choosing not to charge at all for programming or for computer usage. In describing one institution's recent decision to forego the chargeback approach, Bent and Enright (1990) point out that charging campus users would not generate any more money in support of computing while it would reduce the flexibility of the administration in assigning resources to the most important projects. In addition to the findings of the five-year surveys, the popularity of central funding for administrative computing can also be seen in many of the "Campus Computing Environment" features in CAUSE/EFFECT in recent years (Grinnell College 1988; Hamilton College 1989; McMaster University 1988).

Guiding Computing by Committee

Democracy has come to computer decision-making on most campuses. As computers have become increasingly important to both academic and administrative activities throughout the campus and as microcomputers have served to both decentralize and demystify computing, more and more constituencies both need to be involved and insist on being involved in computer-related decisions.

This growing involvement of users has coincided with a trend toward consolidation of control over computing and other information technology at higher administrative levels (Plourde 1986). Although at first glance these may seem to be contradictory trends, they can in fact be quite complementary if they evolve in a coordinated way. In analyzing the potential as well as the pitfalls of setting up a "computer czar" on campus, Fleit (1986) outlines several preconditions which should be present in the institution if such a position is to be effective. One of these is that the institution have in place a sufficient number of well-functioning computer advisory groups, "staffed by people who know what's best for themselves as users and who can take a broad look at what's best for the institution. In other words, the school should not look to concentrate power in the hands of a single individual" (p. 30).

There is one dilemma which confronts institutions as they establish committees for planning and setting priorities in administrative computing. This derives from the fact that the users who are generally closest to the computing needs and therefore are often in the best position to provide the most valuable "input" typically are mid-level or lower in the institution's administrative structure. They have the insight as to what is needed, but lack the power to bring it about. On the other hand, those at the presidential and vice presidential levels have the power but may be quite removed from the day-to-day aspects of computing on campus. In recognition of this situation, institutions often have set up two-tiered committee structures.

There are many examples of this type of two-tiered committee structure (Barone 1987; McMaster University 1988; Wenger, Gualtieri, and Leninger 1987). The specific committee structures, membership, and responsibilities differ from one institution to the next, but some quite common themes run through most examples of this approach. The lower-tier committee typically is composed of administrators such as the registrar, directors of admissions and financial aid, controller, purchasing director, and other middle level administrators whose operations are heavily dependent upon the administrative computing systems. This committee is often quite large and broadly representative. In addition to facilitating the two-way flow of communication between the users and the computer staff, committees of this type frequently are asked to review requests for programming and system development as well as to help with long-range planning in the area of computing.

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Recommendations from this committee typically are then passed up to the vice presidential level. Whether as a formal computer planning and policy committee or as part of the tasks of a more general president's cabinet, decisions regarding the allocation of computing resources as well as the final voice in planning and major hardware acquisitions will generally come from this level. In some instances, the president also becomes involved at this stage.

Indicative of the growing importance placed upon an effective committee structure in university computing is its centrality in a set of guidelines developed recently by CAUSE and EDUCOM. Designed to help institutions in evaluating their information technology resources--both self-initiated evaluations and those in response to accrediting agencies--the guidelines expect that "appropriate structures, such as user and policy committees, exist to provide guidance for the planning of the institution's information technology resources and services" (Evaluation Guidelines 1988).

One Institution's Experience

With that brief review as background, the remainder of this paper will examine the past experience and current plans of one medium-size independent university in dealing with these issues. The university's main campus, which is the focus of this paper, has an enrollment of 3,800 students and offers programs in the arts and sciences and in a number of professional areas. Degrees are awarded at the baccalaureate, first professional, masters, and doctoral levels.

Administrative computing until recently was under the control of the financial vice president. The management and staff of the computer center tried to take a universitywide perspective and were generally responsive to the needs of other administrative users on campus. It was always clear, however, that administrative computing was run by the financial side of the university, that decisions regarding direction of administrative computing were made there, and that projects from that sector usually received highest priority. This advantage was compounded by differential billing practices and the absence of an organized users group.

In 1985, the university began a period of hardware conversion in administrative computing which ended up lasting more than four years. As the initial conversion dragged on and on, delayed in part by unforeseen problems of package implementation and in part by what seemed to be an unending escalation in hardware needs and costs, the campus grew increasingly frustrated with the whole area of administrative computing. In early 1989, a new president decided to move administrative computing over to the academic vice president, who for more than a decade had overseen academic computing on campus. The academic vice president and the director of computer services were asked to assess the problems in administrative computing and to make a recommendation on how to proceed. After several months of consulting intensively both with major users and with vendors of hardware and software, they recommended that the university abort the conversion underway since 1985 and instead make a speedier and less costly conversion to another brand. The president accepted the recommendation and this second conversion was completed in nine months.

Most administrative departments at the university rely on locally designed and written software for their mainframe applications. By the time the second conversion was completed in the Spring of 1990 and it was possible to begin focusing on system development and major programming enhancements, there was a huge backlog of computing needs which had accumulated during the development moratorium of the previous four years. This made even more pressing the

need to work out an efficient, effective, and equitable procedure for approving projects and setting priorities among approved projects.

Some Pay, Some Don't

The university has always followed an "economic" model in administrative computing, an approach which has come under increasing internal criticism in recent years. Although it never attempted to recover costs fully, the university followed a practice of billing the administrative units for both programming and running costs. Academic computing at the university, in contrast, has been operated totally on a "library" model since the mid-1970s.

Administrative computer billing has been in terms of "real money" in the sense that in the budgets of operating units there was no distinction between funds which could be spent on computing and those which could be spent on equipment, travel, etc. Moreover, with a few exceptions budgets were not adjusted to accommodate increased computing costs. The economic model in administrative computing thus has meant that those administrators and departments with the larger budgets had greater access to computing resources, whether or not their computer projects were most important from the perspective of university priorities and goals. It also has meant that regardless of size of budget, departments often faced unpredictable increases in non-discretionary computing costs without any corresponding increase in their budgets. For example, charges for essentially the same level of computing rose from under 50% to almost 70% of the non-salary budget of one department over a three-year period.

Beyond the problems inherent in such an approach, administrative computing at this particular university has had an uneven and inequitable cost recovery structure under which several major areas were able to play by different rules due to purely historical reasons. While most users must pay for all services, one major office is charged for running costs but not for programming, and another entire sector is not charged at all.

As a result of the origin of administrative computing as a branch of the business office in the 1960s and its continued control by that sector until the late 1980s, the finance center has never been subject to charges either for programming or for running costs. This tradition of free computing for the finance area combined with the fact that until recently the computer center reported to the financial vice president gave that sector an obvious advantage over other users. Even with the growth of computer use in other administrative areas, the financial area still represents about half of the usage while accounting for very little of the cost recoveries. The unevenness of the "playing field" was particularly evident several years ago when an expensive new application software package acquired by the finance center was charged to the computing center's budget. It would have been very difficult for any other user area to deflect software acquisition costs in a similar way. Although the advantage of reporting lines was eliminated in 1989 with the change in reporting structure, the billing structure has not yet been changed due to budget adjustments which are needed first and because of emerging plans to eliminate user billing entirely.

Since the early 1970s when the student record system was first computerized, the registrar's office had been assigned a full-time programmer who was budgeted in the computer center. Although perhaps originally intended as a temporary and transitional measure, this pattern has continued until the present day. Some years ago the arrangement took the form of a programmer either physically located in the registrar's office or housed in the computer center but working exclusively on registrar systems. For the past decade, however, it has taken the form of the computer center keeping track of programming time required by registrar projects and charging

this against a "credit" of one FTE programmer. As the registrar's needs in recent years have generally required less than one FTE programmer, the difference in the credit has at times been assigned to projects for admissions, financial aid, and other areas of academic administration. For the registrar's office, however, the effect of this historical arrangement has been that it gets is programming free but still must pay for all computer running costs.

Other than the finance center, the registrar's office, and the occasional case of the registrar's office programming credit being assigned elsewhere, all other administrative computer users must pay for all programming as well as running costs. This has resulted in one of three situations as far as those other users are concerned: (a) some users are unable to proceed with needed projects because their budgets do not allow the cost, (b) some users manage to get their budgets increased to cover the needed expenditures, although there has been no standard procedure for such requests, and (c) some users simply find they are overrunning their budgets due to unpredictable computing charges and end the year with a deficit.

Experience With Computer Committees

As with billing, academic and administrative computing at the university have followed quite different paths in the use of committees. For a few years in the 1970s there was a University Computer Committee whose membership included both faculty and administrators and which nominally had broad jurisdiction over all campus computing. In fact, however, that committee's focus and effective jurisdiction were limited to academic uses of the university mainframe computer, which at that time was essentially an administrative computer which also allowed a certain amount of academic use.

In the early 1980s, that ineffective universitywide committee was replaced by an Academic Computer Committee. The new committee, composed only of faculty and students and focusing only on academic computing, has proven to be much more effective than its predecessor. The committee has provided an ongoing forum in which to discuss academic computing issues as well as a means to facilitate a two-way flow of communication between the providers of computing and the users. Moreover, the Academic Computer Committee in the mid-1980s formed the basis for a successful planning process for replacement of the academic mainframe (a separate academic computer had been acquired in the early 1980s) and has guided the growth in academic computing over the last five years.

In contrast to the situation for the past decade on the academic side, to date there has been no effective forum in which administrative computer users could discuss projects and priorities, much less have any formal influence upon the general direction of administrative computing at the university. This contrast between academic and administrative computing in terms of user involvement in decision-making became strikingly obvious in the mid-1980s as planning got underway for replacement of both the administrative and academic mainframes. As has been discussed in some detail elsewhere (Fennell 1990), the difference in user involvement led to significantly different outcomes of the planning processes.

The outside consultants who were hired to prepare the 1985 hardware conversion plan for administrative computing also noted the lack of a structure for involvement of users in administrative computing at the university. They pointed out that university computing policies usually are developed by a committee made up of management level personnel with a direct interest or concern for the effective utilization of computer resources. Concerned about this lack of a sense of direction in administrative computing due to the lack of a formal computing policy, the

consultants' report urged the university to develop and adopt a formal computing policy addressing areas such as organization, scope of services, personnel, planning, setting priorities, budgeting, and management. A mechanism for setting priorities was noted as a matter of particular importance.

The university followed the consultants' 1985 recommendations on hardware and software, a decision which lead to a long, costly, and ultimately aborted conversion. No action was taken on the consultants' recommendations regarding a long-range plan or establishment of a users committee, however. Consequently, influence on computing direction by anyone other than those in the direct chain of administrative reporting has continued to be minimal, informal, and sporadic.

Steps Toward a Better Way

Following completion of the second administrative mainframe conversion in the Spring of 1990, the university this Fall is initiating several major changes in administrative computing. One change is in reporting structure. After decades of being under the financial vice president and a year and a half of reporting to the academic vice president, administrative computing is now being placed under the university's newly established executive vice president. This new reporting structure should prove to have two distinct advantages. By separating the reporting lines from any of the major user areas--either academic or financial--the change places control of administrative computing in "neutral territory." Moreover, being more directly under the president's office should help strengthen administrative computing in terms of visibility, planning, and funding.

As soon as administrative computing began reporting to the academic vice president in 1989, the decision was made to work toward the elimination of computer charges to administrative departments once the hardware conversion was completed. As noted above, billing for computer use was eliminated more than a decade ago in the area of academic computing, where funding is provided centrally and where students and faculty have unlimited free access to computing facilities for classroom related work and for research not supported by outside grant funds. Given that the system of charging administrative departments for computer work and the corollary expectation that the computer center will generate a certain dollar amount of recoveries to help offset its budget is merely moving money from one university "pocket" to another, it will be both more efficient more equitable to adopt the model which has worked well in the academic area.

Two factors make the elimination of billing for administrative computing more complicated than was the equivalent decision in academic computing, however. Whereas budget recoveries from academic use of the computer were quite insignificant at the time the decision was made in the 1970s to eliminate such charges, administrative computing recoveries currently account for between $400,000 and $500,000 on the "revenue" side of the university's annual budget. To adjust for this revenue "loss" which will accompany a move away from billing, the budgets of a number of user departments will need to be adjusted downward by the amount they would otherwise be paying in computer charges. Determining the appropriate amount for such adjustments will be difficult, particularly given the erratic pattern of charges in recent years as result of hardware and software conversions.

The other major difference is that unlike academic computing, the area of administrative computing involves significant amounts of system design and applications programming by the staff of the computer center. Inefficient, uneven, and inequitable as it may have been, the system of charging administrative departments for that work has served to limit the flow of such requests. With free access under the anticipated change, procedures must be put in place for evaluating proposals and for setting priorities among proposals which are found to have merit and importance.

The university intends to address this latter issue through establishment of a two-tier committee structure. Although the details of membership have not yet been worked out, the basic structure will be that of a broadly representative administrative users group at the lower level and an upper-level planning and policy committee composed of the vice presidents and chaired by the executive vice president. The director of information technology will work closely with both groups.

Under this plan, anyone requesting system design or programming work beyond routine maintenance or minor upgrades will be required to present the proposal to the user committee for review. The committee will review the proposal carefully, examining its intrinsic merits, the importance of the proposal and its urgency relative to other current proposals, and the computer staff's estimate of the magnitude of the task. On the basis of its review, the committee will make a recommendation as to whether or not the project should be done and--if so--how it fits in terms of priority with other pending projects.

Recommendations from the user committee will then be reviewed by the vice presidents, who will make the final decisions regarding project authorization and priority. This is the level at which broader questions of computer policy and planning also will be decided, with involvement and recommendations from the user committee as appropriate.

In addition to an appropriate decision-making structure, this approach to resource allocation also requires establishment of criteria for judging both the merits and the priority of proposed projects (Bent and Enright 1990). One guiding principle which already has been proposed is that priority be given to projects which will bring in more students, bring in more money, or save the university money by increased efficiency. Attention also needs to be given to projects which serve current students, however, with the goal of increasing student satisfaction with the institution which in turn should lead to improved retention (Carroll 1988).

Summary and Conclusion

The university's new approach to approving programming requests and setting priorities among competing projects should have several distinct advantages over past practice. For one thing, it will provide access for worthy projects regardless of the size of the requesting department's budget. Secondly, it will make the process more public and provide a mechanism for review which is open to opinion from all major user areas. Finally, of course, there will be a "level playing field" in that no individuals or units will have any particular advantage over others as a result of reporting lines or historical practices.

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Administrative Resource Sharing Between Components of The University of Texas: Pilot Project and Future Directions

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ABSTRACT

Early in 1989 The University of Texas System established an office to support efforts to share resources for administrative computing. The network to connect the fourteen institutions was being completed and some electronic-mail traffic was going through. During the summer of 1989 The University of Texas at San Antonio undertook a pilot project to move all of our human resources and fiscal support systems to the main administrative facility at The University of Texas at Austin. By September 1, 1990 all targeted systems were in production.

The move to consolidate processing is being accomplished at the same time that distributed systems are being promoted. This presentation will cover the decision to undertake the project, the implications and challenges of this sort of distributed, networked environment, the technical questions yet to be resolved and the future plans for adding components and applications.

Administrative Resource Sharing Between Components of

The University of Texas: Pilot Project and Future Directions

ADMINISTRATIVE OVERVIEW:

The University of Texas at San Antonio is an academic component of The University of Texas System which has seven academic and six health units. Founded in 1969, UTSA opened for graduate courses in rented quarters in the summer of 1973. In 1975, we moved to a 600 acre campus and began admitting our first undergraduates. Now with over 15,000 students and 2,000 employees - including almost 500 faculty, 40 undergraduate and 22 graduate degrees are offered. We have one cooperative doctoral degree with The University of Texas at Austin, and are in the approval stage of another Ph. D. Program. We have grown rapidly in most areas but many of our administrative areas remain seriously understaffed. Understaffed areas include, but are not limited to our Data Processing, Accounting, and our Personnel Offices.

Only recently have we begun an attempt to organize and coordinate the development of our administrative systems. Until September 1, 1990, our Payroll, Personnel, Budget, Accounting, and Purchasing systems were either non-existent, or were separate systems with no integration whatsoever. The Accounting System was, until six months ago, a CICS emulation of the original Burroughs posting machine. Our Payroll System was an old CICS system recently re-written into Natural under ADABAS. The Personnel Program was the best that we had in the fiscal area. It had been written completely in-house, in Natural, and we had a computer literate Associate Director of Personnel who used the system as it was designed to be used. He wrote many of his own programs, and wrote them very well. Unfortunately, he is no longer with us. The budget system existed only in my mind, and in Symphony on my PC. In short, we had some fair to good fiscal and human resource systems, but no integration, and little on-line capability....and we were operating at a very high risk in several areas.

The Legislature of the State of Texas recently passed legislation mandating uniform Payroll, Human Resources, and Accounting Systems. All state agencies, including higher education, were faced with being forced into doing something for which we had too short a time frame, not enough staff to accomplish the job in the time allotted, and no resources to spend. We were also being forced into making our less than satisfactory, non-integrated systems feed into the State System without correcting the problems already existing in our own obsolete programs. Our Board of Regents was displeased because the data flowing from each institution was different and needed a great deal of reconciliation to provide management summaries for regental use. They asked our Vice President for Business Affairs, who was then our Acting President, if there was any way we could speed up the process, yet not go out and re-invent the wheel by buying new packages. Discussions with The University of Texas at Austin and UT-System officials indicated that UT-Austin could run UT-San

Antonio as a separate component on their IBM 3090, under their already existing fiscal systems. It was estimated that at full usage, we would occupy less than one-half of one percent of their CPU. We took this to be a window of opportunity--not only for us as a user, but for the entire UT System as a means of standardization while saving large amounts of the state's resources.

The advantages to us were quite apparent, and were immediate:

1. The immediate inclusion into an already existing and proven system.

2. Since UT-Austin had already been selected as a test site for the required state systems, we could buy time and not have to implement these changes into our less than perfect existing fiscal and human resource programs.

3. We needed no extensive, in-house development, that would take our limited programming staff away from other duties for projects that would actually be "re-inventing wheels."

4. We had investigated some proprietary programs and found none that would provide the unique solutions to Texas higher education problems, without large outlays of funds for modifications.

5. We would provide evidence to the State of Texas that we were serious about the savings of state money by our not purchasing or developing yet another redundant set of fiscal and human resource systems.

6. We would indicate to our Regents that we were serious about providing them, and the UT-System offices, with consistent information obtained at a much lower cost.

The problems we faced were:

1. **Lack of proper, up-front training.** The Personnel and Budget aspects of the conversion were really quite simple and required very little effort on our part. We had to be sure that the file structure and the data transmitted were common to both systems, which was closely monitored by one of our DP people and the Director of Personnel. I was closely involved with the Budget implementation, and other than a lot of data entry, I had no real problems. But, my previous system was PC based, so anything I got was a definite improvement. Payroll and Accounting, however, were so complex that the staffs in the two offices were overwhelmed. We have made very strong suggestions that much more up-front familiarization and training be done before implementation begins with other UT-System components who follow our lead.

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2. **Lack of coordination of the implementation process.** I have suggested that each component coming under the System have a designated liaison at UT-Austin to handle all of the problems. The UTSA Payroll Officer spent untold hours on the telephone, first trying to determine who to talk to, then trying to get the problem solved. A liaison would be the contact person who would do all of the leg work in getting the problem fixed. That liaison, by the way, should be someone particularly well versed in the UT-Austin System. One other problem of coordination was the lack of understanding by the UT-Austin programming staff as to what their change to a program might do to someone else. As I stated earlier, this is a massive, very complex, system, and such problems may be just a cost of doing business that those of us with less sophisticated systems are unaware of.

3. **Lack of responsibility to our unit.** The programming staff at UT-Austin has done a fantastic job in bringing this all about. However, they are paid by, and are responsible to UT-Austin. If we are to successfully carry this concept of centralized processing to its expected end, something will have to be done to create more of a "service bureau" concept with those members of the DP staff involved in the project. UT-San Antonio is only 85 miles from UT-Austin, and when we needed personal assistance with problems, we piled into our car and drove there. Its less than two hours away. Since UT-El Paso is almost six hundred miles away, I doubt that they will want to solve their problems in that manner since their drive would be more than ten hours.

Our conversion is still not completed, but it is going to be successful. It will be successful because of the efforts of our DP staff, the departments affected, and because the long-term benefits of the System far outweigh any short term pain experienced during implementation. Our departments will have immediate on-line access to accounting information they recently could not get, or had to wait for. I anticipate a great amount of labor savings as we all become more familiar with the product. We have already implemented the electronic creation of payroll vouchers. On-line appointments of personnel will soon be implemented thus eliminating the need for typing thousands of multi-part appointment forms each year.

We made a conscious choice to proceed with this conversion even though it meant implementation before some of us were ready. Our Acting President last year recognized that if we waited for the new President to arrive we could lose a couple of years while the question and endless options were being pondered (new presidents tend to ponder endlessly.) Now, eleven months after his hiring, and about six months after we began the conversion, we are nearing completion. In another six months, I truly believe we will all look back and wonder what the problem really was, and we will be proud of what we have been able to accomplish in so short a time.

TECHNICAL OVERVIEW:

There are no truly easy conversions, but some are certainly more challenging than others. This was one of the best. From a technical perspective, such a cooperative venture had been on the horizon for quite some time, and the success of the project was the culmination of various preparatory steps.

UTSA and UT-Austin, along with several other UT components, began the 80's with the vision of shared resources. We built similar environments for administrative processing, centering on Software AG products, ADABAS, COM-PLETE and NATURAL, the fourth generation language. The UT-Austin applications were kept at a level beyond any that UTSA could afford, but they shared expertise, techniques, standards, with us generously. We also imported some of the software which they had written, such as their on-line job submission system. Very little effort was required to make our programmers productive when the conversion began and analysis was facilitated by the common understanding of data base issues.

The network to carry the transactions from our campus to the UT-Austin's mainframe was being finished as our project began. The creation of a network for administrative use followed the example of the academic network which connects the components with the Center for High Performance Computing in Austin, and the work was directed by the same System office. UTSA purchased a new communications controller (IBM 3745-170) with token ring adapter, anticipating a need for versatility as well as growth, and during the fall we were running at 56KB through fiber optic and microwave connections to the Data Processing IBM 3090 in Austin.

The last factor which make the technical work easier was one which all manuals on project management emphasize - we had the unwavering support of upper-level management. I was allowed to commit about two-thirds of the programming staff for the better part of nine months, and we were supported admirably by the Office of Management Information Systems of UT-System Administration, as well as by our colleagues at UT-Austin.

Technically, UTSA gained a great deal from the project:

1. Purchases which had been planned, but not yet funded, were given higher priority. For example, we acquired a mainframe laser printer to be compatible with the print being routed from Austin, so that forms (such as checks) and reports could be produced locally.

2. We established upload-download facilities between the two sites, a feature which took on greater importance as we began to try for integration between the two data bases.

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3. The network was made available and the transfer rate boosted earlier than had been anticipated. Because of our success with the network connection, we will soon be a trial site for a remote token ring connection.

4. UTSA has been able to acquire some products under enhanced system-wide contracts.

5. I was able to divert programming resources from projects, such as HRIS, which were scheduled for future implementation. Because UT-Austin had already built the software for that system, we were able to "piggy-back" on those reporting modules. Our programming staff was able to devote their efforts to the conversion and to building systems which UTSA needed, but we hadn't been able to find time for. For instance, we were able to build a student loan system which integrates with the financial aid and bursar modules of our student records system locally and with the Accounting system in Austin.

There were the usual conversion challenges of data definition, incompatible processing rules and formulas. But the technical challenge that was not completely anticipated was: how do you integrate two data bases that are physically 80 miles apart for on-line transactions? Many of the financial records associated with students should have timely interaction with the Accounting system. Half of the data pertinent to faculty are stored in Austin, half in San Antonio. We have hopes that in a year or so a product will be introduced which makes two ADABAS sites into one conceptual data base. Until then we will be designing and writing systems that load data in batch mode to the mainframe where processing will take place. We have already experienced some double updates and mistimed loads.

Ours was the pilot project in a new era of resource sharing, but within weeks of our start date, other projects within the UT-System had been approved:

1. Three of the medical components, using ADABAS and NATURAL, are cooperating to build a human resources/payroll system to be located at a central medical site.

2. Three academic components have shown interest in converting to the UT-Austin financial systems and UT-El Paso has started the preparatory work.

3. A prototype for a system-wide Executive Information System has been built.

The smaller components, such as UTSA, can look forward to much more complete and sophisticated information systems than we could ever have built on our own.

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TRACK III

ORGANIZATION AND PERSONNEL

Coordinator: George Quinn
University of North Carolina / Wilmington

Papers in this track share ways in which professionals are preparing organizationally for the challenges and opportunities of managing information technology in the future—including such subjects as the kinds and availability of human resources we will need, appropriate training levels and means, changes in styles of organizations.

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Abstract

Surveys shed light on a still hotly debated topic: The Chief Information Officer in Higher Education (Penrod, Dolence, and Douglas, CAUSE, 1990) and Health Care Chief Information Officer (Heidrick and Struggles, American Hospital Association, 1990). Both surveys provide hard data on such areas as title, report structure and responsibilities, personal characteristics and attributes, and issues. The presentation considers implications of these data along with some of the notable soft findings. The session attempts to validate the CIO concept and to identify trends in information technology management.

The CIO in Higher Education and Health Care

The concept of CIO may be one of the most talked-about yet least communicative ideas since facilities managment, and any contribution to explaining it, and putting it into an appropriate context, has got to be much appreciated. -- Linda Fleit, ***Edutech Report***

The CIO Concept

As Fleit suggests, the concept of the chief information officer still requires clarification. This is not surprising, given that the first traceable mentions of the CIO date no further back than 1980 and 1981 to the work of William Synnott. Yet we cannot ignore the fact that, although the concept is debated and at times debunked, it is not ignored. Literature published during the 1980s (376 citations in five electronic databases) consists more of opinion pieces than evaluative studies. Equally significant, over one third of those citations date to the single year of 1988. Only two, or six percent, occurred before 1985. The concept, then, is relatively new, with the first occurrence credited to William R. Synnott in a 1980 *Computerworld* article and in the following year to the book coauthored with Gruber, *Information Resource Management: Opportunities and Strategies for the 1980s* (New York: John Wiley & Sons, 1981).

The Surveys

From Synnott on, the literature has consistently implied linkages between the CIO concept and the information resources management (IRM) approach. Surveys of CIOs suggest the controversy surrounding the concept, however, if by no other way than by the types of data they choose to collect, such as data on title, reporting structures, and responsibilities for strategic planning and policy. Insights regarding these and other issues can be gained from two surveys completed in 1989 and published in 1990.

The first of these is *The Chief Information Officer in Higher Education* (CAUSE Professional Paper Series #4, 1990). In this paper, Penrod, Dolence, and Douglas provide an overview of the CIO concept in business, higher education, and health care. They conclude that hard data are generally lacking and proceed to report on their own survey of CIOs in higher education. The second of the 1989 surveys discussed here is *Health Care Chief Information Officer* (Healthcare Information and Management Systems Society of the American Hospital Association, 1990), an update to the 1987 survey published in 1988 and included in the Penrod literature review. (For an extensive bibliography on the CIO literature through 1989 and the first few months in 1990, consult the Penrod document.) Both surveys take on special interest, given the continuing visibility of the CIO concept in 1990.

At the November 1990 Symposium for Computer Applications in Medical Care (SCAMC), a panel entitled "Beyond the CIO: A New Organizational View" and chaired by a professional recruiting consultant, included members from the Johns Hopkins Health

System, Abbott Northwestern, and the Evangelical Hospital Association. In the book *Healthcare Information Management Systems: A Practical Guide* (Springer-Verlag, 1990), the index includes 22 citations for chief information officer (CIO), 16 for information management systems (with three cross references), and only eight for hospital information system (HIS); no other term is so extensively referenced. The October 1990 issue of *Manage IT* reports on seven CIO searches at the University of California/Davis, University of Pennsylvania, University of Minnesota, University of Tennessee, and three campuses of the University of Wisconsin (Eau Clair, Stout, and Madison). Certainly it would appear that any announcements of the death of the CIO concept in higher education were premature!

The higher education survey, directed by James Penrod, includes responses from 58 CIOs out of a pool of 139 identified (42 percent). Data were analyzed by Analystical Studies staff at California State University, Los Angeles. The health care survey, conducted by Heidrick and Struggles, the Healthcare Information and Management Systems Society (HIMSS) of the American Hospital Association, the Center for Healthcare Information Management (CHIM), and Andersen Consulting, reports on 137 participants out of a sample of 265 individuals (51.7 percent) responsible for the information management function of health care organizations.

Commonalities between health care and higher education are suggested by the finding that 80 percent of the responding CIOs in the HIMSS survey are employed by not-for-profit organizations (interestingly, the 1987 survey showed only 71 percent in this category). As will be documented below, the findings for these not-for-profit organizations appear to show marked differences from data on the latest Coopers & Lybrand/DATAMATION survey of over 400 of the nation's top 1000 companies reported by Carlyle in a rather negative and chiding article entitled "The Out of Touch CIO" (*DATAMATION*, 15 August 1990). Further evidence of commonalities is the mention of salary data for CIOs at university affiliated teaching institutions in the HIMSS survey. As the Penrod review of earlier surveys pointed out, the raw data are not available for analysis, and this group of CIOs remains hidden in the HIMSS summary. However, the nature of the descriptive data implies the trends and issues regarding the CIO concept. Below, the two surveys published in 1990 are summarized.

Findings

Composite Profiles. The typical CIO in both sectors is a white male in his forties.

	Health Care	Higher Education
Mean Age	43 years	46 years
Gender	Male (89.7%)	Male (93.1%)
Ethnic Background	"All White"*	Caucasian
Education	Masters 57.5%	Masters 79.3%
	Doctorate 0%	Doctorate 62.1%

* Data from 1987 HIMSS study; not available in 1989

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Title, Organization, and Tenure. Many of the opinion pieces published in the last decade focused on the use, or non-use, of the CIO title. Penrod states in the literature review that the CIO "function... is here to stay, no matter what we call it." Nonetheless, titles are a reasonably reliable indicator of organizational status.

	Health Care	Higher Education	
Vice President/Sr VP	32.6%	Vice President/Chancellor	34.5%
CIO and Other Title	20.0%	Assoc/Asst VP/VC	25.8%
CIO	12.6%	Vice/Assoc/Asst Provost	10.3%
Director	23.0%	Director	23.0%
Other	11.8%	No response	12.1%

In addition, the HIMSS survey shows a remarkable increase in the use of the CIO title in the two years since their first survey. At that time, only 6.9 percent or the respondents reported having the CIO title.

The survey findings suggest that CIOs tend to be located in relatively complex or large institititions. A CIO in higher education is most likely to be working at a research university (51.7 percent) or a comprehensive institution (32.8 percent), and a health care CIO is most likely on the staff of a hospital with 500 to 999 beds (35.8 percent) ot more than 999 beds (17.2 percent).

Tenure in CIO positions appears to be short. Two thirds (66.9 percent) of the health care positions have existed for less than five years. In higher education, almost a half (46.6 percent) of the respondents reported that they have held their positions for less than three years.

Reporting Structure and Responsibilities. Reporting structures vary in both health care and higher education.

Position to Which the CIO Reports

	Health Care	Higher Education	
Chief Executive Officer	32.1%	President/Chancellor	39.7%
Chief Operating Officer	34.3%	Executive/Other VP	36.2%
Chief Financial Officer	25.5%	Provost/Academic VP	19.0%
Sr VP Ops/Adm	8.1%	Other	5.2%

It should be noted, however, that the HIMSS study showed a full 82.1 percent of the respondents felt that they *should* report to the CEO. This is particularly wise, given the cross tabulations of responses in the Penrod study which reveal that CIOs who report to the president are in a number of respects better situated than those who do not and differ from them in a number of ways. Higher education CIOs who report to the president are more likely to approve institutionwide information technology purchases, to have more administrative and technical staffs, and to be executive officers. They are also more likely to be what

Penrod identifies as information resources management type organizations (basic organizational units plus others) and to hold academic rank.

	Health Care	Higher Education
Executive Officer	50.7%	58.6%
Regularly Attend Board Meetings	54.5%	48.3%

In presenting the findings on higher education, Penrod concludes that "Organizational units headed by responding CIOs appear to be idiosyncratic to the personalities, politics, and histories of individual institutions." His data and that gathered for the HIMSS survey bear out that conclusion.

Areas Supervised

Health Care		*Higher Education*	
Information Systems	98.5%	Data Communications	96.6%
Telecommunications	65.4%	Administrative Computing	89.7%
Management Engineering	30.9%	Academic Computing	86.2%
Medical Records	14.7%	Voice Communications	69.0%
Admitting	10.3%	Planning	32.5%
Quality Assur/Util Rev	7.4%	Television Services	26.7%
Materials Management	6.6%	Institutional Research	19.0%
Departmental Info Serv	6.6%	Printing	17.2%
Ancillary Services	5.1%	Mail Services	17.2%
Marketing/Planning	4.4%	Copying/Reprographic Service	17.2%
Business Office	3.7%	Media Services	15.5%
Other	3.7%	Library	15.5%

Compensation. As in earlier surveys, compensation data are difficult to compare, because they are constituted differently in different sectors and summarized differently from study to study. Penrod finds a median salary of $89,167, whereas HIMSS reports a mean salary of $77,570 with a mean cash bonus of $6,720 for 41.6 percent of the respondents and a wide assortment of perquisites for 75 percent of them. The end result makes compensation in the two sectors fairly comparable. In an interesting crossover between higher education and healthcare, HIMSS reports the highest "average" salary ($84,930) to be that of CIOs at university affiliated teaching institutions. Data in the HIMSS survey shows base salaries for CIOs to increase with the bedsize of their employing institutions. In higher education, salaries for CIOs were related to title, with vice presidents/chancellors paid at a higher level (median $103,571) than assistant/associate vice presidents/chancellors (median $95,000) and other titles (median $83,000).

Budgets and Information Systems. Mean departmental budgets in health care totaled $3.175M in 1989; again budget was directly related to institution size, with the health care CIO most likely to work in a 500-999 bed facility and to have a budget of $4M. In higher education, the typical CIO had an annual budget of $9.6M; 27.6 percent had budgets of $1M to $5M, 13.8 percent $5M to $10M, and 24.1 percent $10M to $20M.

Other Findings

The descriptive data from the two surveys suggest the positions which CIOs now occupy within higher education and health care. They also clarify critical roles and functions which the CIO position addresses and offer a rebuttal to some of the criticism leveled against the position. Notably, respondents to both surveys reported a commitment to planning. In health care, 80.3 percent reported that a methodology had been implemented for the planning, acquisition, design, and installation of information systems, slightly fewer (78.4 percent) said that they had completed a "long range" plan in the last three years. In higher education, 67.2 percent indicated that their institution had a formal strategic plan for information resources, although fewer than half reported a strategic plan for the institution as a whole (43.1 percent) or a formal planning model (44.0 percent).

Significantly, planning was also ranked as the second most important function by the higher education CIOs and was perhaps suggested by the high rankings given "Leadership" and "Provide Vision."

Higher Education

"Most Important Functions"	
Leadership	80.8%
Planning	71.2%
Communication/Liaison	61.5%
Provide Vision	34.6%
Manage Information Systems Budget	34.6%

"Most Important Characteristics"	
Communication/Interpersonal Skills	73.6%
Good General Management Skills	60.4%
Technical Competence/Knowledge	52.8%
Vision for Information Technology	41.5%

If these rankings are significant, they may also be implied by the category of attributes for success in the HIMSS survey. (According to Heidrick & Struggles, health care CIOs were curiously reluctant to credit vision for their own success: 79.4 percent of respondents deemed it necessary for other CIOs but only 28.9 percent credited it with contributing to their own success.)

Health Care

"Attributes for Success"	
Leadership	83.1%
Vision/Imagination	79.4%
Business Acumen	49.3%
Knowledge of Hospital Systems	44.1%

Strategic Issues. Ratings of strategic issues for both sectors also demonstrate shared concerns. In the HIMSS survey, 86.6 percent of the respondents agreed that "CIOs should emphasis their strategic rather than their managerial role"; a smaller number (54.1 percent) agreed that "The most important role of the CIO is to integrate the functions of information systems, management engineering, and telecommunications." In higher education, respondents listed integration among the top strategic issues their institutions face.

Higher Education: Strategic Issues

Networking, infrastructure linkages, connectivity, LANs	51.7%
Integration of technology into curriculum, with each other, into mgt/admin	48.2%
Resources for acquisition, operations, etc. (incl. standards to maximize investment)	44.8%
Providing technology and training in support of instruction, research, etc.	37.9%

Regarding networking, it should be mentioned that one of the hottest issues now being discussed in health care is the development of Health Level 7, also known as HL7, which is the term for software which will allow true integration of multiple systems. Panels on this concept have drawn large crowds at conferences, as at the 1990 HIMSS meeting.

These responses, however they are interpreted, stand in opposition to the findings of the 1990 Coopers & Lybrand survey of business CIOs, who drew heavy fire from Carlyle in *DATAMATION* (15 August 1990) as "dangerously disconnected from the business side of the house, customers and the executive's own users." Those CIOs ranked issues on a scale of 1 to 10, with the following results:

Business CIOs
Impact of Issues

#1	IS credibility
#2	Retraining, acquiring & keeping IS staff skills
#3	Increased management expectations
#4	Redefining technology, data & applications strategies and architectures
#7	Establishing a strategic role for IS
#17	Integrating & applying multimedia technologies

Implications

The findings of the health care and higher education surveys published in 1990 support the conclusion reached in the literature review included in *The Chief Information Officer in Higher Education*:

> There are major differences between CIOs and their roles in business, health care and higher education. Examples of these differences include salary structure, profit motivation versus non-profit enterprise, magnitude of budgets, and types of management applications....Such examples seem to be reflective of the basic differences between the enterprises rather than functions of the CIO position. (20-21)

The findings of both surveys underscore an additional point Penrod makes in his conclusion: evaluation is not mentioned in the literature or in responses to survey questions. Future studies might be constructed to yield some measures in this area. The repetition of the HIMSS survey, like the annual Coopers & Lybrand survey, provides insights on the evolution of the CIO position. An iterative study in higher education might do so as well. With both higher education and health care facing increased pressure to demonstrate effectiveness and return on investment, not only the creation of new CIO positions but also the continuation of existing ones may depend upon such evaluation.

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Only with rigorous assessment will the profession be able to continue to evolve "both in numbers and in administrative acumen, to keep pace with the change, and consequent needs, wrought by the continuing revolution of information technology," as Penrod hopes. Such surveys provide much needed data. As the profession advances, both health care and higher education will benefit.

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Desktop Power: Issues and Opportunities

CAUSE 1990

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Abstract: Universities can deliver desktop power to address needs across the whole spectrum of administration. We develop this thesis beginning with a brief description of two studies focusing on administrative needs recently conducted at the University of Chicago. We describe our approach, discuss our findings, and identify some of the roadblocks preventing the effective use of desktop power. Finally, we offer several problem-solving ideas you can use to increase the benefit of your computing investments through desktop computing.

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Introduction

At the University of Chicago, we recently conducted two studies focusing on administrative needs:

- An exploratory study of administrative computing needs and issues
- A study of academic computing, including academic administrators

We began the administrative study by developing a set of survey instruments to be used in interviewing the users of mainframe systems in central administrative departments, beginning with the Comptroller's Office. We attempted to gain a broad picture of administrative computing needs by asking users first what they did, then with what tools, rather than evaluating administrative computing in terms of reactions to individual existing systems.

The users within the Comptroller's Office pointed to specific important problems, many to do with reporting, analysis, training, difficulty of use, etc. in the mainframe systems. They also pointed out their need for various management tools. With specific exceptions, however, most noted that they were quite satisfied with their technical support staff and felt they could go to them for help in resolving system problems, and their needs would be addressed within resource constraints. In other words, although resources were regrettably scarce, most felt a source of help was available to them.

Interestingly, however, several of the users in the Comptroller's Office pointed us outward toward the divisions and departments, noting that this was where the real needs were, and advising us to talk with administrators throughout the University. Several interviewees in the Comptroller's Office were very vocal about the administrative problems on campus outside of their office and felt that more effort should be concentrated on those needs. We therefore left the Comptroller's Office and began interviewing administrators in other parts of the University.

In the course of the interviews with people both from other central departments and in academic divisions and departments, we found a high number of desktop computers, but widespread dissatisfaction and a number of needs which could have been met using the desktop computers, but were either not being met, or were being addressed inefficiently and redundantly. This led to our definition of the *desktop power opportunity*--that portion of administrative needs that could be met through carefully applied desktop solutions (discussed in more detail below).

As the study progressed, problems began to surface again and again which, though different in their specifics, could be categorized into larger, representative problems which we labeled "issues." The intensity, consistency, and quantity of the comments indicated we were dealing with more than ordinary complaining. We publicized the issues to our Administrative Computing Board (the highest ranking board for administrative computing on campus).

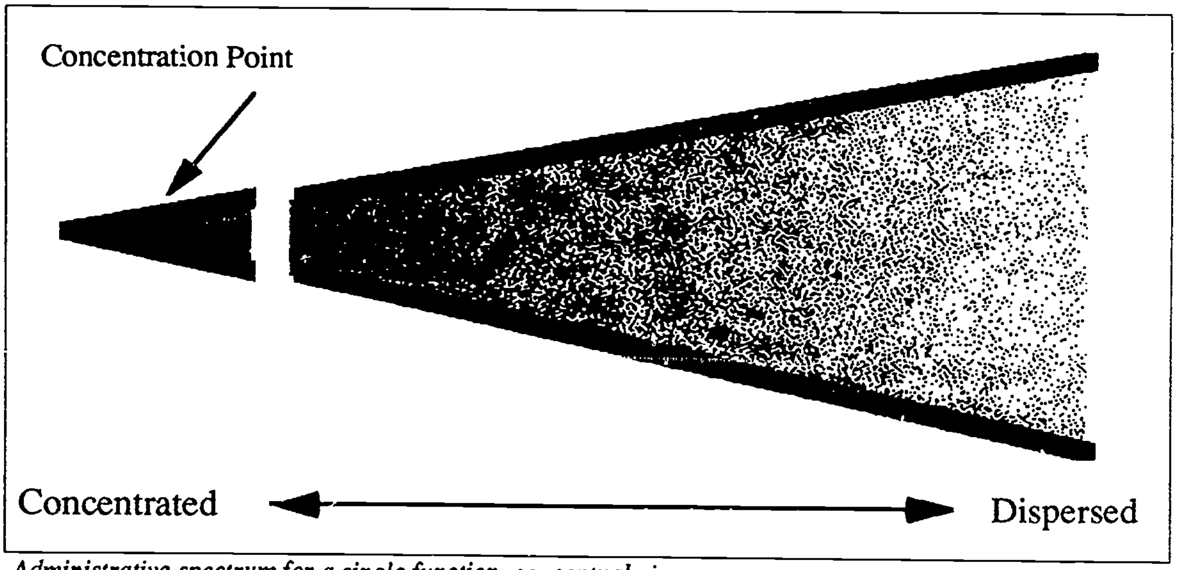
Some time later, we were involved in a study of academic computing needs, in which faculty themselves requested us to interview their academic administrators and to address the problems in academic administration. The administrators we interviewed brought up the same issues articulated in the administrative study, reinforcing our belief in their accuracy.

All-in-all (including seminars conducted after the initial studies) we interviewed over 100 people involved in administration. In both studies, administrators and academic personnel alike expressed their appreciation for the study and their fervent hope that it would have a positive impact on meeting their computing needs.

The Spectrum of Administration

Administrators are responsible for managing the financial, organizational, and physical environments which support the University's primary missions of instruction and research. In this paper, we use the term *administrator* loosely to mean all those whose primary job is administration, which includes some heavily administrative academic personnel and all administrative agents (such as secretaries, administrative assistants, and fiscal assistants).

Often, we think of administration in terms of central administrative areas. For instance, when we think of purchasing we think of the Purchasing Department, payroll brings the Payroll Department to mind, and registration reminds us of the Registrar. During the course of our administrative study, however, it became clear that central administrative activities are only the tip of the administrative iceberg. For each functional area, a spectrum of activity, ranging from highly concentrated to widely dispersed, exists outside of the central office. A central office might, in fact, be considered an *administrative concentration point* on the spectrum for a particular function. Outside of the central office for the function, a host of vital, decision-intensive administrative activities related to the function are conducted at the University which tend to be hidden and distributed throughout campus, but nevertheless have a great impact, producing the majority of all data at the University. The medium of communication between the dispersed and central portions of administration is currently, for the most part, paper forms and reports.



Administrative spectrum for a single function, conceptual view.

The diagram above shows the administrative spectrum for a single function. Each central administrative office falls at the extreme left of the spectrum for its particular function and has University-wide responsibility for that particular administrative function. (For example, the Purchasing Department is the concentration point for the Purchasing function.) The spectrum for each function has a different shape. Some are wider and shorter, some longer, etc. Some have almost no dispersed portion, others have no clear concentration point.

Dispersed administration encompasses all the activity related to a <u>specific</u> functional area that takes place outside of the central office responsible for the function. In other words, <u>all</u> accounting activity at the University outside of the central accounting office, whether <u>it takes place in a central department or not</u>, is dispersed administration. It is important to understand

that people within central departments, when they are not working in their area of speciality, are every bit as much involved in dispersed administration as those in academic departments. For example, managers in the central accounting office spend the lion's share of their time on demanding accounting activities, but must still prepare budgets and hire and fire using the same tools as persons in what we traditionally regard as more dispersed administrative areas.

Dispersed administrative activities vary in complexity, scope, and duration, including tasks such as grants management, budget submission, financial reconciliation, and a host of other activities performed by administrators. Examples of persons performing dispersed administration are deans, directors, managers, principal investigators, administrative assistants, senior secretaries, and fiscal assistants. There are many gradations of activity within dispersed administration. Toward the left of a function's concentration spectrum, we find people who, though outside of the central concentration point, nevertheless spend a large portion of their time on activities related to that particular function. For instance an associate dean for management and budget within a large University division might work heavily with accounting activities, but is also concerned with activities related to other administrative functions. This person might also delegate accounting responsibilities to agents who then spend as much time on accounting as their counterparts in the central accounting office.

As we move to the right along a function's concentration spectrum, we find more and more people involved in the function, but generally spending a smaller percentage of time with it. Again to use accounting as an example, one finds highly dispersed activity performed by decision-makers such as deans, department heads, and academic administrators to whom accounting is critical, but only a small part of whose job involves dealing with accounting-related matters. Here, the accounting function is highly dispersed, both in terms of the number of people performing it and the fraction of each person's time spent on accounting activities.

Now let's complicate the picture by adding in another function--say, budget preparation, once again tracing the spectrum of activity within the function from highly concentrated to widely dispersed. The Budget Office is the concentration point for this administrative function. Budget Office workers spend 90% of their time on budget-related activities. But this time we find that the central accounting office manager, the same person who was part of the concentration point for the accounting function, is a dispersed administrator in the context of budget management, spending only a small fraction of his or her time on this activity. At many points along the budget spectrum, we encounter the same administrators as we did on the accounting spectrum.

Clearly, a large potential for multi-function complexity exists at the fringes of the administrative spectrum. A significant number of administrators, particularly those in isolated academic departments and in small or mid-size divisional offices, must deal with many small pieces of dispersed administrative activities. These persons' work is highly fragmented and interrupt driven. Their efficiency is hampered by the sheer diversity of tasks they must perform and by the number of their interfaces with central administrative concentration points.

In the course of the study, we interviewed many administrators involved in dispersed administration. Though we have not conducted a census, we estimate that there are between 300 and 400 administrators whose days are broken into tasks related to multiple administrative functions. Added to these are the hundreds of fiscal assistants, secretaries, and other clerical and support staff who work full time on dispersed activities. In addition, we noted that people who spend most of their time with a) academics or b) activities related to central administration (including analysts, accountants, lawyers, computer specialists, architects, etc.) also spend time on dispersed activities. For an illustration of the number of people involved in dispersed administration, note that more than 34,000 account ledger reports are sent to over 2000 account

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administrators across the University every month. Each person who examines a ledger report is performing a dispersed administrative activity.

Understanding Dispersed Administration

The primary product of the University is education and research. Efficient, effective administration is part of the climate fostering or hindering that research. Since administrators and faculty alike benefit from good administrative support and share some of the same information needs, solutions that enhance administration ultimately benefit the academic community (especially those members who perform formal dispersed administrative functions). As effective administrative systems are developed, administrative productivity will improve and academicians will be able to streamline their own administrative activities.

Because of the sheer magnitude of dispersed administration, the University stands to gain the most leverage from addressing the highest priority needs across the whole spectrum of administration--both within central concentration points and within dispersed administration. Therefore, one of the most pressing requirements at the University is to establish a mechanism for understanding and prioritizing the computing needs of the dispersed administrator along with those of administrators in central concentration points, where a (perhaps imperfect) means for prioritization already exists.

In order to understand the real needs of the University employee performing dispersed administrative activities, one must cease to see the world in terms of one administrative function or one system at a time and take a holistic view. One must see the world from the administrator's desk, often looking outward toward many concentration points at one time. Many dispersed administrators must deal with enormous multi-function complexity, as demonstrated by the number of paper forms generated in the course of routine activities. This complexity is not obvious when one approaches dispersed administration from the viewpoint of a particular concentration point.

Only by taking the dispersed administrator's viewpoint can we understand his or her real needs. As stated by one study participant: "We need people who understand that the central offices are not the pivot points around which the University revolves. The University's product is education and research and we should chart a clear course toward emphasizing those activities that benefit students and faculty the most."

The administrative study described here was, to our knowledge, the first attempt at the University to take a holistic view of the needs within the dispersed portion of University administration. Although we do not claim to fully understand the complex needs within dispersed administration, we discuss below some of the insights we gained over the course of the study.

Dispersed Administrative Needs

In our exploration of dispersed administration, we identified a number of specific needs, which we have categorized below into three areas. Overall, we found in talking to administrators that they need help simply in doing a better job of administration. They view computerized tools as one of the means to that end, not a need in and of itself. Because the dispersed administrator's job is usually not tied to any of the mainframe systems that directly support central administrative concentration points, they do not think of needing better access to X, Y, or Z central system, although most are aware that these systems exist, and many even know their names. Dispersed administration includes the following broad categories of tasks (the amount

and kind of work in each category varies depending on the amount and complexity of the person's administrative responsibilities):

- Performing general administrative tasks
- Preparing and submitting data to concentration points
- Retrieving and analyzing data from concentration points

NOTE: Although this section focuses on dispersed administrative needs, many of the concerns discussed below also apply activities in administrative concentration points.

Performing General administrative tasks

Dispersed administrators have responsibility for numerous general tasks such as mail merge, scheduling, correspondence, filing, and list management. Day after day, administrators at the University make things happen. A significant amount of administrator time is spent on general tasks; common sense desktop efficiency solutions are needed to make these tasks more efficient so administrators can concentrate as much as possible on high-payback management oriented activities.

Preparing and submitting data to concentration points

Many dispersed administrative management activities (e.g., budget, hiring, academic appointment tracking) require administrators to deal with paper forms. Administrators need ways to 1) streamline the production of the paper forms (currently, nearly all forms must be typed), 2) reduce the amount of paper they must handle and 3) submit data to concentration points in an easier way. The need for help in this area increases exponentially as the number of administrative areas in which the administrator is involved rises. A great amount of time goes into this area of administrative activity, yet this potentially high-yield area is often overlooked.

Retrieving data from concentration points

This need can be summed up in the phrase "the information I need when I need it in the way I need it." Administrators need electronic access to the data they submit to central concentration points at any point in the processing cycle, from the time of initial entry until final approval and disposition. In addition, they need to be able to integrate that information both across multiple functions (e.g., across payroll, accounting, and budget) and across time (e.g., historical and variance comparisons) and to incorporate and present that information in the form of management reports.

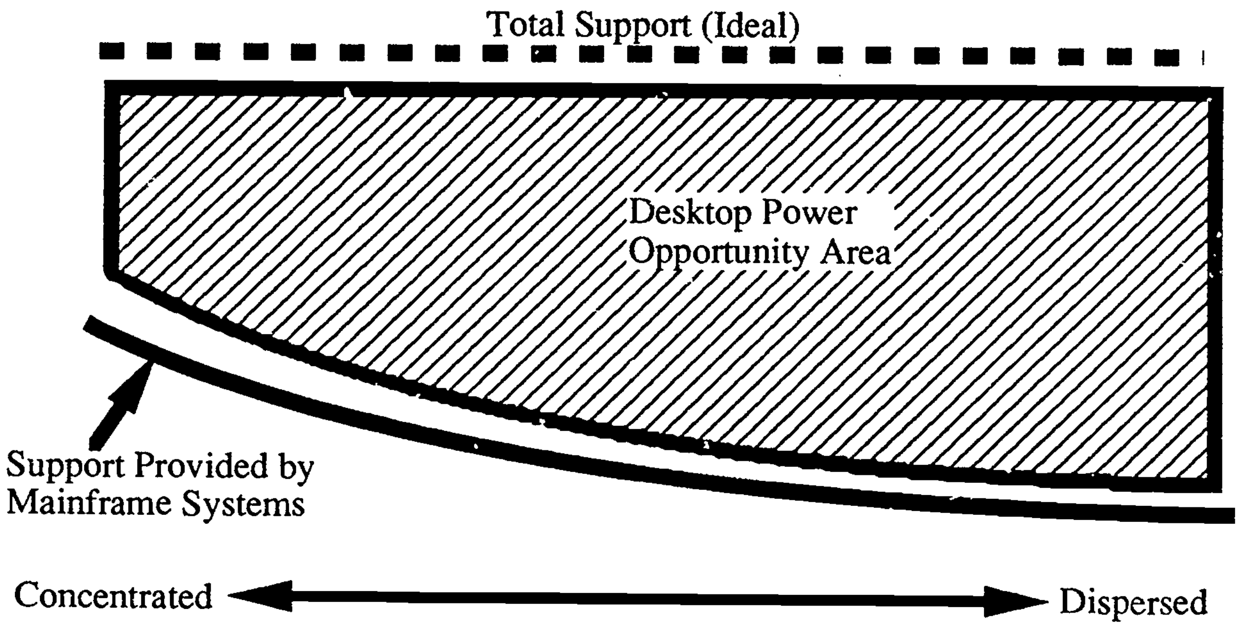
As a simple example, grant administrators need to be able to integrate payroll commitments into grants analyses. A divisional administrator might need to pull together information from the faculty system and the student system. A department head might need to integrate information from the accounting system into budgetary projections. Administrators, especially, who deal with many functional areas, need ways to meld together some of the dispersed functions where they fit logically into a whole.

The Desktop Power Opportunity

In the past, the major task of administrative systems was to automate clerical functions. Central offices had the most visible concentration of clerical employees, and central departments were best positioned to sponsor and develop systems. In addition, computing technology was best able to support centralized operations. It was therefore natural that traditional central system development assumed that the requirements for a system intended to support a particular functional area, such as accounting, could be properly dominated by the

needs of the one central office responsible for the function. Although the focus of central systems efforts has started to broaden to dispersed administration, dispersed administrators are increasingly frustrated with the inabilities of systems designed with the concentration points of administrative functions foremost in mind to meet their needs.

The number of personal computers at the University has increased steadily over the last several years. Personal computers, linked where appropriate with solid mainframe systems, provide a great deal of CPU that the University can tap to meet those needs not now being met at the University (in both concentrated and dispersed areas). We have labeled this the *desktop power opportunity*.



Roadblocks to Tapping Desktop Power

In the mid 1980s, administrators began to acquire personal computers, and by 1987-88 a critical mass of these machines began to exist at the University. But although many administrators are using their computers to advantage, needs remain unmet for many others. Why? During one interview, a director, unprompted, summarized a number of the problems we encountered: "These are the things that irritate me: Lack of policy and support. No money. No guidance, no direction as to the best and most efficient way of doing things. No support for management reporting. There is no one to help us tap the power of the mainframe and no one to give us help of any sort. Communication is very poor. We need management information tailored to what we need. As it is, we are completely on our own with micros."

As we explored administration from the viewpoint of the dispersed administrator, we encountered a number of specific roadblocks that are preventing administrators from using their desktop computers to become fully informed.

- Lack of training
- Lack of standards and guidance
- Lack of support
- Unavailable data
- Lack of appropriate tools
- A plethora of paper

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NOTE: Financial shortages were mentioned frequently as a problem in administrative computing and many of the roadblocks could be overcome, in whole or in part, by increased resources. In this time of tight budgets, however, the funding of any administrative improvements must be carefully judged for cost effectiveness. We explore cost-justification and other issues in a later section entitled "Delivering Desktop Power."

Lack of Training

Dispersed administrators' efforts are often hindered by an extremely rudimentary level of microcomputer knowledge. Administrators were repeatedly frustrated by the lack of microcomputer training available.

Lack of Standards and Guidance

Few University-wide guidelines or standards exist for acquiring or using local computing resources such as hardware, networks, programs, technical support and consulting services. There is no absence of opinion, but an authorized source for standards does not exist.

As a result of the lack of standards, a huge diversity has developed in computer hardware and software. The results are costly: we encountered an example where a deputy director needing to share data carried not just a disk of information, but an entire PC bask to her desk, then spent 4 hours reformatting the information into her spreadsheet. We also see cases where administrators purchase new, outdated equipment (such as PCs without 286 chips).

Lack of Support

The University does not provide sufficient technical support to allow the majority of administrators to take full advantage of the power in existing desktop computers. Administrator after administrator cited this lack as a major computing roadblock. One dean said: I wish there were a resource I could turn to and say: set me up! I don't want to have to be a computer expert. I have plenty of other work to do. I just wish someone could come along and do this computer stuff for me so that I could concentrate on my job.

Unavailable Data

Some of the data needed by administrators in order to manage their areas of the University is currently non-existent in electronic form. Often this lack is a matter of timing (i.e., information is not captured at a timely point in the processing cycle). For example, purchasing requisitions now affect accounts only when they are actually entered into the mainframe computer. However, administrators monitoring purchasing (a dispersed administrative activity), need to see the effect of requisitions on their accounts in order to know how much they have spent and how much they have left, because to these users. once the request is signed, the money is spent. This need is especially acute for grants managers with approaching grant expiration dates.

At times dispersed administrators lack information that does reside in central mainframes, because they do not have access to it. Countless times administrators told us, "I need to know whether a bill had been paid." The answer to this simple question resides in the University mainframe. Currently, those administrators who do have access to mainframe data often do not use it or avoid it because it is difficult to use. This is particularly true of administrators who deal with multiple functions. The traditional view has been that people who really needed access would learn to cope with the difficulties of getting it. Current thinking, however,

suggests that it may be worthwhile to the University to ensure that available data is used even by those stymied by access problems. The University must, however, expend resources where the greatest payback exists, emphasizing access to strategic data expected to produce the greatest payback.

Another data availability problem is that, currently, the most productive software tools available to dispersed administrators sit on the desktop, but data, by and large, sits on the mainframe. This results in great inefficiencies as people attempt to bring the data back to their local machines through rekeying. A large number of those we interviewed expressed frustration with the lack of readily available management data. We saw cases where *managers* spent time rekeying data from paper account ledger reports. Graduate students and clerical personnel throughout the University are typing information that exists in mainframe systems into spreadsheets. While not always bad, this effort can be wasteful.

Lack of Appropriate Tools

Many administrators cited a lack of appropriate tools for their work as a significant roadblock in their use of desktop power. Desktop resident (as opposed to mainframe) packages are preferred by administrators both because they are familiar and because they provide the flexibility to structure the local system environment to meet individual needs. Desktop tools are also easy to use and well-suited to dispersed administrative tasks.

Administrators have many of the raw tools they need, but little in the way of prepackaged solutions on which they can draw to maximize their efficiency. One could argue that all that is needed in this regard is proper training. Certainly this would help, but many administrators feel their jobs are complex enough without having to computerize their own tasks.

As we conducted this study, we observed great inefficiency as literally hundreds of administrators across the University independently invested time and resources in developing different solutions to essentially the same set of dispersed administrative needs. To illustrate: Approximately 30 quotes in our interview notes refer to administrators' independent implementations of accounting tools to analyze their monthly financial data.

The question remains: to what extent should the system needs within dispersed administration be addressed by a central investment of resources? We discuss further some concerns related to this topic in the section entitled, "Delivering Desktop Power."

A Plethora of Paper

The volume of paper transferred around the University every month is a serious hindrance to increasing the speed and efficiency of dispersed administration. Not only must forms be physically filed, retrieved, tracked and distributed, they also require administrative offices to continue using typewriters rather than focusing in on the powerful tools in their computers. The University might be able to realize significant efficiencies by replacing high-volume paper forms with electronic communications.

Delivering Desktop Power

At least three factors must be considered in decisions regarding possible approaches to delivering desktop power:

- Possible solution sets
- Infrastructure prerequisites
- Pragmatic requirements

Factor 1: Possible Solution Sets

The possible solutions to the problems must be understood and examined. Three solution sets, each with the potential to occupy an entire paper, are summarized briefly below.

- Set A: Immediate, lower-cost activities that the University can engage in now to improve desktop computing include 1) ***targeted user training*** in currently available desktop computer packages, 2) *better communication and publication* (for instance, establishing a clearing-house for solutions; providing conduits, such as networking, newsletters, support groups, user groups, etc., to improve communications between administrators), 3) establishing *standards and guidelines* with effective site licensing (also an area of high concern to academic personnel), and 4) continuing to improve the *functionality* of and *dispersed access to mainframe systems.* Simple focused *support* of dispersed administrative computing will do much to meet administrator needs and to deliver desktop power.

- Set B: Many corporate and university mainframe applications, though old by computer standards, are nevertheless solid workhorses that excel in high speed, large quantity processing. Such systems have been called "legacy systems." Major corporations, as well as Universities, who have invested in legacy systems have difficulty in justifying their replacement, but distributed users are often less than impressed with the ability of legacy systems to handle their local needs. They are demanding better access to information housed on the mainframe, and want improved tools for analysis and manipulation of the data.

  A trend therefore exists toward *pragmatic data integration.* This term was coined by the Gartner Group to describe the grouping of diverse mainframe systems under a single front end that would appear to the user to integrate underlying mainframe systems, although consistent, fully integrated data storage might not be financially practical below. Participating desktop computers would be networked to take full advantage of electronic communication, turning diverse computing functions into large conceptual systems.

  Such a solution would allow the University to deliver desktop power through teaming up the mainframe and the local computer to take advantage of the capabilities of each. Bill Gates, of Microsoft Corporation, recently suggested the same in discussing the concept of "information at your fingertips." Simply put, the idea is that all the data typically needed in business should be instantly accessible from a desktop personal computer. "In the future, computer users will forget about their applications and think about their documents instead."* *Project Mandarin*, an integrated administrative workstation project at Cornell University, utilizes the same concept. The University of Maryland has also embarked on a venture designed to provide administrators with access to mainframe data.

- Set C: The University might take advantage of the possibilities offered by modern hardware and software technology to reengineer existing systems into new, more cooperative architectures, possibly pushing University computing onto a different cost/performance curve. For instance, one might implement a single database under a coherent set of administrative systems, necessitating real, rather than pragmatic, data integration. This solution set might involve the acquisition of UNIX workstations and the implementation of network-based distributed databases (again, perhaps teaming up local and mainframe power). Dispersed and central administrators both could take advantage of the tools in the

* Darryl Rubin, Microsoft software architect in charge of future office software.

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new systems. Such an option, however, is costly and, with a limited potential for staff savings, can be difficult to cost-justify.

Factor 2: Infrastructure Prerequisites

Many desktop solutions require a stable infrastructure consisting of components such as networking and solid mainframe systems. For example, an appropriate network, implemented with proper security and audit measures, might be used as a routing device for the data now routed on paper forms.

Networking, a powerful tool for communication, links concentrated and dispersed activities electronically, creating dynamic bridges between isolated islands of activity. Networking tends to raise the general level of computing knowledge at the University. For example, as administrators incorporate electronic mail into their communications, the computer becomes an integrated part of their work rather than a foreign object on their desk. Networking also presents excellent opportunities for synergies between administrative and academic computing needs. Academic personnel are increasingly demanding networks, and administrators can piggyback on this demand.

Factor 3: Pragmatic Requirements

We have identified at least three considerations that must enter into decisions regarding solutions. Any solution must:

- Be a potentially high-yield investment. In every situation, we want to look for the highest return on the next dollar spent.
- Fit within the University's culture, which, at the University of Chicago, is highly decentralized and autonomous.
- Build on our installed base of computing or complement our long term computing strategy.

Where We Are Now

This is a section filled with questions, for our study was only exploratory and we still have many issues to resolve. Some things we can say with reasonable certainty (e.g., a need definitely exists for targeted training). Many other issues are still fraught with questions, often revolving around the pragmatic requirements presented above.

For instance, questions of yield come up in regard to the prioritization of dispersed and centralized administrative needs. One must consider both centralized and dispersed administration and make resource tradeoffs, choosing those needs that offer the highest yield on each investment dollar.

Questions of culture arise in connection with the possibility of centralized system development for dispersed administration. There is little disagreement that data preparation, submission, retrieval and analysis tools on the desktop can greatly improve an administrator's efficiency and, since many administrative tasks are essentially the same, it would seem logical to develop one set of tools and distribute them where needs exist. However, particularly within our strong tradition of decentralized autonomy, a multitude of questions arise in connection with central development: Are there efficiencies to be gained from centrally developed tools? Should each department simply be given the freedom to provide tools as they are required? Is central development cost effective? Can greater leverage be gained from other approaches? Can such tools ever be flexible enough to satisfy the needs of a diverse user group? Can such tools be

effectively supported within resource constraints? Would a centralized approach imply a loss of autonomy, or would it be welcomed?

These are questions we are still exploring at the University of Chicago. Some argue that standardization and centralization are the only efficient way to provide desktop tools. Others counteract, however, that such an approach runs counter to the grain of the University and would be unworkable--and perhaps even undesirable. Like the "invisible hand" in economics, local autonomy allows individuals to adjust their tools according to their own needs, according to their own highest priorities, as evidenced by their payment of cold cash. (However, just as in economics, inefficiencies can and do exist in the "market.") Perhaps the answer to this division lies in a combination of centralized and decentralized approaches, continuing individualized solutions where they have utility, but meeting needs in a common manner where users themselves can identify areas of sufficient commonality and can justify central development.

These same arguments arise in connection with many of the issues raised by this report, such as how to provide support, training, etc. In order to resolve some of the questions, we are currently experimenting with new approaches while concentrating on building an infrastructure that will support innovations and modern administration. A challenge is to manage these experiments in such a way as to 1) coordinate changes, such as networking, that are happening of their own momentum, 2) facilitate desirable changes that won't happen without targeted management, and 3) avoid sucking up resources now to an extent that would preclude trying alternative options in the future.

Conclusion

The desktop power opportunity offers a wealth of computing power to the information-intensive job of University administration. With so much staff time, including academic staff time, spent in dispersed administration, universities must address the needs of this potentially high-yield area. In order to truly understand the needs of administrators in dispersed locations, however, one must see the world of administration the way the dispersed administrator sees it.

The challenge is to channel desktop computing power in cost effective ways that significantly increase administrative quality and that have the ultimate benefit of changing the way the University works for the better. By investing in its valuable administrative resources, the University can create a richer academic environment to support its primary mission of instruction and research.

SUPER PRODUCTIVITY, SUPER SAVINGS:

ACHIEVING THE POTENTIAL OF INTEGRATED ADMINISTRATIVE COMPUTING

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The potential of integrated administrative computing and information systems has not yet been realized in most organizations including higher education. Increased productivity of 50% or more has been cited as a realistic objective. To achieve these improvements it will be necessary to fundamentally alter the structure of our organizations. The organizational paradigm of future high performance institutions will be info-centric - i.e., they will be organized around their information structures. The computer will be their primary communication and information handling tool so it will appear they are also compu-centric - organized around the computer. The organizational design elements of the industrial age must be replaced with design elements much more consistent with the information age. Restructuring of the magnitude required will not be a comfortable process but will be necessary for continued competitive advantage if not survival.

SUPER PRODUCTIVITY - SUPER SAVINGS

ACHIEVING THE POTENTIAL OF INTEGRATED ADMINISTRATIVE COMPUTING

HIGH TECH - HIGH EXPECTATIONS

The promise and expectation of technology has been increased productivity. When the potential of electronic computing began to be realized, the promise of increased productivity from this newly available technology expanded almost beyond hope of realization. Delivery of desk top computers to employees created further expectations for increased productivity. However, according to some experts, organizations are lucky if they can realize as much as a 10% increase in productivity after giving computers to their employees.

Higher education is an industry in which administrative costs have been rising more rapidly than inflation. The costs of complying with additional regulations and reporting requirements are two of the many reasons often cited. Not withstanding the greater need, increases in administrative productivity in higher education have not been much different than other organizations generally.

LOW PRODUCTIVITY LIVES ON

Many organizational behavior consultants are now suggesting reasons for the continuing lack of increased productivity in spite of the heavy additions of computing power, both hardware and software. The reason for not realizing the expected increased productivity is that computer technology has been laid on top of the existing organization structure which, for most modern organizations, had been structured around the industrial age model.

At the beginning of the industrial age there were no appropriate models to serve as patterns for the large industrial organizations that were to come. Two hundred years later we are in the early information age. Again, there appears to be no appropriate models. All we have are the familiar industrial age models to serve as patterns to meet our emerging needs for more effective organizations. The legacy of the industrial age has been the adoption of well established, almost rigid, concepts that are resistant to change in the information age.

BECOMING INFO-CENTRIC AND COMPU-CENTRIC

One thing appears certain...successful organizations of the future will be organizing around their information structures. The total information structure of the organization now appears to provide a more suitable focus around which to organize. They will be info-centric organizations - i.e., organizations whose value is based on information and are organized around information. The information structure encompasses everything known relative to the organization from the environment in which the organization operates to the preferences of employees and customers. We will also organize around the computer as the chief tool that makes this possible and thereby become compu-centric as well.

Encouraging estimates suggest that by organizing around our information structures we will enjoy productivity increases of 50% or more. Such organizations will enjoy a more total involvement of all employees who will be far happier as well as more productive.

OLD ORGANIZATION HABITS

A major transitional effort aimed at the organizational structures in our institutions is needed urgently. Most employees still work for industrial age style organizations. These organizations, in their more rigid and extreme manifestations, can be recognized by their hierarchical structures, their rigid communication channels, management by command, the notion that thinking is a function of top management and that doing is done by those at the bottom. In these organizations, middle management often appears to act as a two-way filter, preventing those at the top from knowing what is going on and those at the bottom what is expected. Work is done as a serial process with the next step not started until the previous one is completed. Tasks are segmented according to the division of labor. Individuals are defined by the position of their box on the organization chart. Employees are rewarded for doing their narrowly defined task, doing as they are told.

Thus, the legacy of the industrial age treats employees almost as machines and views organizations as machine-like structures. So it is that machine theory controls and dominates the organization with task specialization, standardization of performance, centralized decisions, uniform policies, and no duplication of functions. These characteristics have so dominated most modern organizations that these principles are generally accepted without question.

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MORE COMPLEXITY - MORE FUNCTIONAL VALUES

As technology and more complex organization structures have developed over time, wealth has been measured in various ways. It was land in the agriculture age; labor in the early industrial age; and capital in the later industrial age. Knowledge, however, becomes the basis of wealth as we make the transition to the information age. The values of the industrial age also give way to the values of the information age. These values now include knowledge, the ability to see significant patterns, networking, team work, and trust.

The contrast in values between the industrial age and the beginning of the information are essential to grasp: superior/subordinate relationships vs. peer to peer; the confining box on the organization chart vs. each individual's knowledge as a resource; blindly following orders vs. the expectation to engage in dialogue; acting as a cog in the wheel vs. understanding the vision of the total enterprise; operating in automated inflexibility vs. full participation in the discovery process for problem solving.

TIME FOR TRANSITION

The transition from industrial age organization structures and their ingrained practices to information age structures and their more appropriate practices will be wrenching to those comfortable in the rigid hierarchy typical of those older practices. Those practices appeared to work and provided wealth to individuals, organizations, governments and cultures for two hundred years. Therefore, the urgency to change may be slow in its realization. However, the fundamental terms of the transitional conflict are power (which was the basis of the industrial age model) versus knowledge (which is the basis of the information age model).

The value of the individual employee will be higher in the information age. The valued and contributing employee in the information age will have knowledge. He will be valued, in fact, for all knowledge previously acquired as well as ability to acquire more knowledge. This employee will know how to get things done, what needs to be done by using the ability to discern patterns based on accumulated knowledge, will know when things should be done by developing a sense of timing and an understanding of what is realistic. This employee will know where things can and should happen and will know why they happen by understanding the context within the environment as well as the vision of the organization.

The incentive to move deliberately toward designing and implementing the information age organization is captured in

the idea that "all organizations are perfectly designed to get the results they get."

TOOLS FOR TRANSITION

Systems theory suggests that organizations have responded to all the influences, intended and unintended, of managers and employees, as well as the larger environment, with the result being the current state or condition of our organizations. In doing this, managers have operated frequently using various fallacies of management including: treating organizations as if they were lifeless (machines); assuming organization goals are the same as the individuals who work for those organizations; ignoring the environment and looking only inward at the organization itself; looking for the "one" best way; looking for single rather than complex cause and effect relationships; dealing only with a portion of the organization while ignoring the effects on the whole; forgetting that the environment determines the organizational purpose; believing that motivation is something that is given, not possessed; assuming that people with different goals are uncooperative; measuring results but not evaluating whether the organizational purposes are still valid.

Systems theory suggests that organizations can be better understood using that theory as a framework. Organizations are, if fact, open systems - that is, subject to the effects of the environment (as opposed to closed systems which are self contained). As such, organizations are alive. They have certain characteristics which must be understood if they are to be transformed (and the transition to an information age organization will likely be as traumatic as major surgery).

ORGANIZATIONS LIVE

The living organization structure has several components: its boundary defines its limits of operation; its purpose is defined by the environment within which it operates, it has a "contract" with the environment to take certain resources and give back certain products; its inputs are the resources it takes from the environment; it transforms or modifies the inputs through various processes; its outputs are the products that go back into the environment; feedback informs the organization regarding the appropriateness of its purposes; the environment must be satisfied or the organization will not survive.

As a living structure, the organization engages in several system processes. Information coding provides what it knows about the environment. If its coding paradigm is faulty

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then essential information will be filtered out and it will be less efficient in meeting the needs of the environment. It seeks a steady state and therefore will resist being transformed from one state (industrial age structure) to another state (information age structure). To survive an organization must take more energy from the environment (negative entropy) than it both uses and returns to the environment. Unlike other living things, organizations can renew themselves. Equifinality, systems reaching the same final state from various starting points demonstrates an adaptive ability. Open systems are self-regulating in pursuing their purposes. Organizations as well as individuals, operating as open systems, will pursue their own purposes. Specialization increases as systems grow in complexity in order to cope with growth and maintain the steady state. Highly specialized organizations will more strongly resist change.

ORGANIZATION PERFORMANCE MODEL

The organizational performance model is useful both for assessing the current structure and especially for designing a more appropriate structure. The model consists of five components: the environment within which the organization operates, the strategy used by the organization to interact with the environment, the design elements used to carry out the strategy, the culture that arises from the interaction of the design elements, and the results actually achieved.

The design elements are crucial since they shape the culture which determines the actual results. As managers determine how to carry out the strategy they will make design element decisions, based on their own perceptions and experiences (generally based on the industrial age model) regarding, for example: the tasks people do, the structure in which they work, how they are rewarded, how decisions are to be made, the information they will use, and about the people themselves who do the work. It is especially in this area of design elements that the most recognizable and undesirable effects of the industrial age can be transformed to a design more appropriate for the information age.

In the information age structure the design elements must be more appropriate to support productive people. The tasks engaged by employees can be made more whole rather than the segment usually assigned as a result of the division of labor. The structure must have fewer layers so that communication flows will be efficient. Information must be more accessible with availability not dependant on position or rank. Decisions should be made at the peer level when possible. Trust will need to grow so that checking up on the work of others will be recognized as an unproductive

exercise. Rewards should be based more on contribution rather than job title or seniority.

ORGANIZATIONAL ASSESSMENT

The organizational performance model can be used to assess current organizational health. In this process, the parts are analyzed in reverse order starting with a comparison of the results with the future environment. Following this, there is an examination of the operating culture. Next the design elements are analyzed. The actual operating strategy is identified. Finally, the actual operating strategy is compared with the environment.

ORGANIZATIONAL DESIGN

The organizational performance model can also be used to design a far more appropriate organization. In the design process it is appropriate to begin with the environment and design a strategy to fit the environment. Next the design elements should be changed as needed. The impact of the design elements on the culture should be identified. Finally, the results to be produced by the new culture should be predicted.

CHALLENGE FOR CHANGE

The challenge for higher education is clear. Can we restructure ourselves following the processes that we teach on the academic side of our institutions? Do we recognize environmental threats that should spur us to action or have we become blinded such that no significant threats are visible? Do our institutions struggle to maintain a steady state in spite of clear environmental feedback that change is needed? Our individual challenge is to educate ourselves and our associates about the advantages of operating as an information age organization - organized around our information structures - sensitive to the needs of the environment and the needs of our people.

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Effectively Merging Administrative and Academic Computing: Indiana University's Experience

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In January 1989, Indiana University's administrative computing organization and the Bloomington campus academic computing organization were merged by an agreement between key administrators and faculty. University Computing Services, the resulting organization, has since undertaken and completed a major reorganization. The reorganization was carried out in consultation with representative administrative and academic end users. The new organizational structure encompasses all technological and service delivery components for administrative users in the eight-campus IU system and academic users on the Bloomington campus. An initial evaluation of the merger and reorganization is now possible. This paper provides that evaluation, along with a description of the context of the merger and the resulting reorganization.

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The merger of Bloomington Academic Computing Services (academic computing) and Information Services (administrative computing) that took place on 1 January 1989 at Indiana University has had substantial consequences for computing at Indiana and elsewhere. The merged organization, University Computing Services, went through an 18-month period of reorganization that resulted in a structure that little resembles its predecessors. Arriving at this structure took extensive consultation with academic and administrative end users to identify their needs, and many discussions with a large part of the University Computing Services staff. The structure has proven effective in encouraging excellent quality service delivery and technological innovation. This paper address the historical context of the merger, the organizational context of the reorganization, service delivery and technological innovation in the new organization, and end users' perspectives on the results of this merger and reorganization.

The Historical Context - Barry M. Rubin

This section of the paper provides some background on the two former computing organizations at Indiana University, and on the environment and factors leading up to the merger that created University Computing Services. Several major differences are immediately apparent with respect to the structures of the former computing organizations. First, the academic computing organizations reported to the Bloomington campus vice president while the administrative computing organization reported to the eight-campus, system-wide executive vice president for finance and administration. Second, though both organizations had operating budgets of approximately $10 million in 1988-89, 90% of the academic computing budget was subsidized by the Bloomington campus, while 60% of the administrative computing budget was based on user charges. Academic computing staffing stood at 100 FTEs and 70 part-time consultants and hourlies as opposed to 130 FTEs for administrative computing. Each organization had three major divisions, but academic computing had 12 management units all on the Bloomington campus; administrative computing had 17 management units, two of which were on the Indianapolis campus.

Two major differences between the organizations were in computing resources and network technologies. Academic computing had ten VAX minicomputers, a CDC 170/855, an IBM 3090/120 with VM/CMS, and about 500 PC and Macintosh workstations in student computing clusters and classrooms. The main academic communications network was based on asynchronous technology that was quickly becoming dated, with a slowly emerging Ethernet-based TCP/IP replacement. Administrative computing's primary central resource was an IBM 3084Q mainframe, with MVS, CICS, TSO, and VSAM file structures. The administrative network was IBM's SNA.

The advisory structures for these organizations were also drastically different. Academic computing utilized a 38-member faculty advisory committee that participated in all major decisions and policy making. Administrative computing had only a systems development review board composed of eight representatives of IU vice presidents, and served exclusively to allocate a $1 million systems development subsidy fund.

The missions of these two antecedent organizations also differed markedly, as one would expect. The mission of administrative computing was focused on transaction processing, management information systems, and report generation; its primary client group was administrative departments. The mission of academic computing was to provide research and instructional support; its primary client groups were faculty and students.

These differences in structure and mission were certainly important. But the primary differences between the two organizations, the ones that proved the most difficult to deal with, were the two disparate cultures of computing that arose as a consequence of these dissimilar organizational structures and missions. The administrative computing culture is best characterized as dominated by centralized decision making and a hierarchical management style; business dress and hours; applications developed or maintained by the staff using a predefined methodology (SPECTRUM); computing staff desktops occupied by IBM 3270 terminals or 3270 PCs; a strong commitment to customer service; a single-vendor (IBM) computing environment; and a production-oriented data center with multiple back-up plans and change management processes. The academic computing culture, by contrast, had consensus-based decision making with a variety of management styles; many employees who dressed informally and kept hours similar to those of faculty and students (i.e., anything but 8 to 5); applications developed primarily by end users;

computing staff desktops occupied by PCs, Macs, or advanced workstations; excellent user responsiveness; a multi-vendor "open" computing environment; and central computing resources which were not "production-oriented" or particularly (at least in the opinion of the faculty) well managed.

An important aspect of the environment immediately preceding the merger is the satisfaction users felt with the separate computing organizations. Administrative computing users felt they had a stable, dependable computing environment with excellent-quality transaction processing and a production-quality network. Administrative departments that relied on these systems for their day-to-day, mission-critical business could be operational 99% of the time. Response time for CICS transactions had improved dramatically over the past few years to the point where users were satisfied, if not downright happy, with performance. In addition, administrative end users employing the FOCUS report generation language against VSAM file structures could access institutional data for ad hoc reporting purposes. While this certainly wasn't relational database processing with natural languages, it did give some access to the data without requiring CICS and COBOL programming skills.

Yet administrative end users felt a good bit of frustration that emanated from a failure, on the part of the leadership of administrative computing, to be truly responsive to user needs. End users were generally excluded from helping to establish long-range directions for the evolution of the administrative computing function. In fact, for the 10 years before the merger, there was little evidence that planning for such directions had taken place. With respect to systems development, while end users could partner with Information Services to identify user requirements and specify the preliminary design of systems, they were effectively shut out of participating in the implementation stage. Even though several administrative departments had computing staffs of their own that were just as capable as those in Information Services (and may have in fact come from Information Services), access to the development environment was the exclusive domain of the administrative computing organization. Furthermore, decisions about priorities for new systems development projects were not made in an objective way, but were politicized by the agendas of the eight members on the systems review board. If an end user department was not well connected with one of these representatives, the likelihood of having a project successfully funded was considerably reduced. Small units, in particular, often received very little attention, no matter what the merit of their proposed projects.

Though FOCUS access to institutional data files was available, the training required to use this tool against VSAM file structures intimidated most end users. There are only 200 to 300 active FOCUS users in a university of 10,000 employees. Many potential cost-effective uses of institutional data are going unaddressed due to a lack of access tools such as relational database management systems and fourth-generation languages. This problem was exacerbated by slow implementation of a promised data administration function. Another frustration for end users was the lack of documentation on using systems and on the technical specification of application systems.

From the perspective of the academic end user, particularly faculty members, the ability to use central computing resources without charge has been a great boon to research. The faculty advisory committee reaffirmed this academic computing policy continuously throughout the 1980s. In 1988-89, the Bloomington campus had a central computing environment adequate for most research and teaching applications. A student technology fee was implemented by the campus beginning in 1987. This resulted in PC- and Macintosh-based student computing clusters and classrooms that allowed faculty to begin incorporating microcomputer applications into their courses. Although the intra-campus network was beginning to cause response time problems, it did provide a functional environment for campus and inter-university communications.

However, a significant number of faculty, especially in the sciences, were not well served by the academic computing environment. They needed more computing cycles devoted exclusively to research. The response time in the VAX environment and on the network was also becoming an irritation to many faculty — significant problems and delays occurred at peak usage periods during the academic semester. Slow implementation of an automated catalog for the campus library was also a major frustration for faculty and librarians. Though both computing organizations were working on this project (the library system was being developed for the IBM mainframe using NOTIS but would be delivered across the academic network to faculty offices and student clusters), progress seemed

slow. Faculty and librarians had been promised this system for so many years that the commonplace attitude about its delivery was skepticism. Faculty were also frustrated by their inability to get access to the institutional database for applications that could assist them in carrying out their instructional or advising/administrative responsibilities. Another major concern of academic users was integration of the academic and administrative networks for such mundane purposes as the ability to send and receive electronic mail from users of the administrative computing environment (not to mention use of the automated library catalog, should it ever be implemented).

Academic end users were also concerned about the lack of a voice for faculty or student needs in the establishment of administrative systems development priorities (not too many faculty were well connected with vice presidents or their representatives). A final desire of academic end users was the addition of staff to the academic computing organization who had sufficient technical depth to address upcoming issues such as client-server technologies, UNIX-based computing, advanced workstations, and distributed databases.

The most significant of the driving forces and enabling factors for the merger was a substantial change in Indiana University's administration. A new president took office in fall 1987, and a new vice president for finance and administration came to the university shortly thereafter. Coming from the private sector, this vice president was unaware of the litany of reasons for separate academic and administrative computing enterprises. As a result, he served as the catalyst for the merger, and was one of the two primary decision makers in this process. One rationale for the merger was the growing recognition among the administration that the cost of computing was escalating at a time when cost-containment was becoming essential, and that merging the two units would result in some cost savings that could be redirected to pay for new services. Two factors mentioned previously, slow progress on implementing the automated library and integrating the administrative and academic computing networks, also helped drive the administration in the direction of the merger. Finally, the relationship between the leadership of the administrative computing organization and end users (both administrative and academic), and between the university administration, had been characterized by varying amounts of tension and distrust throughout the 1980s.

Several other factors contributed to staff and faculty agreeing to go forward with the merging of the two computing organizations. First, there was a substantial amount of confidence in the potential leadership for the new organizational structure. Second, at least on behalf of the faculty, there was a perception that the potential benefits (e.g., an automated library catalog and integrated networks) outweighed the risks. Third, administrative and academic end users were involved in the merger effort from its inception. Finally, the university and campus administration reached an agreement that guaranteed a) a dual reporting line so that the new organization would report to the campus vice president on academic computing issues and the system-wide vice president on administrative computing issues, b) separate academic and administrative budgets, and c) an ability to return to separate organizations (i.e., "push the reset button") if the merger did not succeed. These guarantees were instrumental in convincing both faculty and administrators to endorse (but not without some trepidation) the merger concept.

The Organizational Context - Polley Ann McClure

This paper examines the organizational context for the merger of computing at Indiana University in three parts: the process, the strategic plan that guided the organizational design, and the specific structure for the new University Computing Services organization.

Accompanying the service and policy goals that helped drive the merger were goals for the process of accomplishing the merger. First, it was essential not to lose focus on the basic business of the institution even during the process of reorganization. This process has been described as taking off simultaneously from Heathrow and Frankfurt in two Boeing 707s with crews that speak different languages and in flight, over the Atlantic, redesigning and rebuilding the planes into one 747. Paychecks had to get out, and researchers' tools had to remain available. Second, the merger offered a chance to develop a new technology architecture for the university — neither former organization had been in a position to "escape its past." Third, we sought to rapidly bring the incompatible networks, systems, and applications into technological convergence. And fourth, we sought increased responsiveness and flexibility.

Indiana University was and still is in a period of very significant change in all aspects of its function, brought about in part by a new administration, a new academic agenda, and programs to improve the efficiency and productivity of the administration. The new computing organization has to be responsive to that change, and able to assist other units with the change that faced them. Fifth, the merger must be managed to make organizational change at least acceptable, if not pleasant, for staff. And finally, staff should remain engaged with their work and committed to the organization and to Indiana University.

The process of the merger contributed to its success. We began by polling our users and customers to determine the services and support they anticipated needing in the decade ahead. From their answers we derived a service portfolio and support environment. Once we had a picture of needed services, we could devise a plan for the technology and place the appropriate emphases on the respective types of technology. We planned how to get from where we were to where we needed to be. Finally, we designed an organization that had the structure and the set of functional rules that allowed us to deliver the service, technology, and support environments. The important thing is that we designed the organization *last*, not first.

The main process took about 18 months. We set up an interim management structure in which the associate directors from the two former organizations reported to me. The two organizations ran as a grafted-together whole for about a year until we completed plans for the new organization. In a series of weekly operational meetings we made most of the important organization-wide decisions. While acting as interim managers, the associate directors and I formed a core planning team. We commissioned a task force of users and customers to identify their key service and support needs. Our planning activity took place in a series of evening "pizza meetings." Working in teams, we developed a series of papers describing our service, systems, and network architectures, and the organizational design that would support them.

The first group products to emerge in spring 1989 were a drafts of a new mission statement for University Computing Services and a list of shared values to guide its operation. These documents were highly useful; they did then, and still do, serve as informal documentation of, and a contract for, the directions we adopted. As the drafts became available, they changed the brainstorming focus of the pizza meetings to critique, review, and revision. Finding that many of our assumptions and technical vocabularies were at odds, we devoted time to "intense mutual education" to better understand each other's business and one another as individual professionals. As these drafts stabilized we distributed them to the managers and supervisors, then over brown-bag lunches, discussed and revised the ideas. As the drafts evolved, we distributed them to outside staff groups, advisory committees, to our bosses and colleagues. The process resembled a circle beginning at the outside with user input, spinning to the center, then through the processes of consultation, argument, and revision, spinning into an ever-widening series of circles. Though we remained open, staff began to get restless about mid-spring. We circulated a status report, and two weeks later, a draft of the organizational design draft.

Once we agreed on the organizational design, we began to recruit for the associate directors to head the new divisions. We declared all of the associate director positions "open," invited applications, and conducted a national search. By November 1989 all but one of the positions were filled. One came from outside Indiana University, three came from former associate director positions in the two organizations, and two came from other ranks in the old organizations. We appointed an acting AD in the unfilled position, reopened the search, and began unit-level planning.

We realized early on that we would need some flexibility in staffing if the organizational structure were to differ from that of the two previous organizations. We had put a soft freeze on vacancies that occurred during the year or so of intense planning activity. By November, the end of the first year, we had accumulated about 25 or 30 vacant positions. We now invited staff to indicate their preferences for assignment to the new divisions. Most wished to continue roughly as they were. The 10 or 12 who sought change were interested in the new workstations and networks divisions. Each associate director then developed a draft unit plan requesting the number of staff positions needed to do the work. The total positions requested doubled the number we had! We negotiated the numbers back to

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the original number of positions. Next, staff names were written on index cards and "auctioned" to the associate directors to fill the number of assigned vacancies.

About 85% of staff were positioned this way with relatively little disagreement. The remaining 15% tended to be the technical stars. These were young, technically excellent people whose skills could be used in a number of different positions. We resolved those conflicts by inviting the individuals to decide their divisional assignment. At this point staff were apprised of their new assignments, but were asked to retain their old responsibilities until they had been formally accepted in their new positions. We used a ball carrying metaphor: "Don't drop any balls."

Spring 1990 was devoted to individual units' internal plans and responsibilities, and to recasting the organization budget. By late spring we were badly stuck in gridlock: new owners couldn't accept new responsibilities until they could pass on old ones; but the targeted new owners faced the same dilemmas. The planning team was faced with unresolved details of responsibilities, that now surfaced as squabbles and questions. These unclear responsibilities we called "cloudy balls." We invited all staff to list what for them were cloudy balls, then spent an afternoon resolving them. Progress resumed, and by May we seemed close to being settled with our new responsibilities.

The process of developing a strategic plan was a key step in designing the new organization. The faculty and staff committees had helped us identify a series of five major goals for the next five years. First is the need to develop a modern distributed computing environment for Indiana University. That has three very important components: 1) a single ubiquitous high-speed data network that can link all of the workstations with all of the university information and computing resources within university, 2) the delivery of sufficient shared computing resources and information, and 3) a major new emphasis on developing workstation-based computing. The second goal was to improve and enhance access to institutional data. The third: make major improvements to the student computing environment. The fourth goal called for developing the support tools that would enable faculty, students, and staff to use these resources and programs. Finally, we needed to act so as to enhance service quality while containing costs.

The former computing organizations reported to separate vice presidents, coming together only at the level of the university president. Each organization had three main divisions. Both had one dedicated to large-scale or time-shared computing systems. The academic organization had a "network services" division to oversee distributed computing, and an "information services" division to provide education, publications, and consulting services and the internal business function. Administrative computing had a data center, a division devoted to systems development and information access, and a small business office function.

The new organization consists of six divisions. Four focus on technologies and two on support. This new organization reports jointly to the vice president for finance and administration and the vice president for the Bloomington campus. The Management and Administration division is responsible for publications and all of the internal administrative and management functions. Information Systems is the systems development and data administration division for both academic and administrative information needs. Workstation Systems supports personal computer and advanced workstations for students, faculty, and staff. Network Systems manages both administrative and academic wide-area networks and supports LANS. Computing Systems manages all of the shared computing resources including the IBM mainframes and VAXcluster. Support Systems provides the educational programs, consulting, and support that underpin the other functions. Another way of looking at the organization (and the way we conceived it) is as a matrix with four technologies, each with internal divisions for technology standards and planning, applications, and service delivery in their own domain. Support Systems and Management and Administration span the whole. We've already seen some slippage in the symmetry of the theoretical design. Computing Systems wants to slip the noose on applications. Workstations Systems wants to pass the development of administrative applications on workstations to Information Systems. The design's biggest weakness is the problem of coordination across these technology units.

Service Delivery and Technological Innovation - Susan Stager

Prior to the reorganization, the administrative and academic computing centers (and the campus) believed the needs of academics and administrators differed significantly — hence the need for two computing organizations. Interestingly, prior to the reorganization, the services provided by IU's administrative computing center and by its academic computing organization, *on paper*, appeared identical. In reality, these services were very different. The documentation provided by one organization bore little resemblance to that provided by the other. The overlap in training services was primarily in word processing, and even then we saw differences in class length, the speed of presentation of materials, and topics. Both organizations offered central system cycles, but on different platforms. Users could lease one type of equipment from one organization, but not the other; or worse, users could lease the same type of equipment from either organization, but at a different price. A major task of the reorganization was to create an integrated service environment reflecting the best of both preexisting computing organizations.

Prior to the reorganization, UCS support units were concerned that after the merger, the support needs of one constituency would take precedence over the support needs of the other. Academic researchers felt that the old Academic Computing organization had given them the highest priority, and feared the new combined organization would not have the same set of priorities. Administrative customers such as the Registrar and Bursar felt that the old Information Services organization had given them the highest priority, and feared the new combined organization would not have the same set of priorities. Our constituencies saw everything as black and white: Which was more important, they asked, compute power to support cancer research or compute power to support the university payroll system? Luckily for us, it was not back or white. One of the most creative things we have done since the merger is to allow one of our top researchers in the hard sciences to "soak up" excess cycles on the administrative mainframe. We've located the grey area in service delivery and we are capitalizing on its existence.

We decided administrative and academic customers had basically the same support needs, though we know it's a topic of much debate. Some critics say that the word processing and communication needs of administrators and faculty differ. Our experience has always been that the word processing and communication needs of any two administrators or any two faculty differ, so we are not overcome by differences *between* faculty and administrators. We still maintain there are more similarities than differences in support needs. Both faculty and administrators want quick, accurate answers to their computing questions and they want assistance as painlessly (both in mental and financial terms) as possible. Meeting these criteria of "quick," "accurate," and "painless" is no small feat. Though many of the computing applications are the same for administrative and academic users, their use of those applications may differ. A researcher may use word processing for a long document; an administrator might want to merge form letters with a list of alumni. So the support services staff need the depth of skills to match the width of services.

The support services structure of the combined organization has now solidified. We recognize, however, that support services' structure must always be fluid, constantly adjusting to the new needs of the users, new technology, and new funding concerns. Currently, the new support organization has five units: the Support Center, Cluster Consulting Services, Departmental Consulting Services, and IUPUI Support Services. (IUPUI is another campus of Indiana University, located in Indianapolis and jointly operated by Purdue University and Indiana University.)

The Support Center supports fundamental uses of all "supported" or "user-required" technologies. It provides direct technical consulting, assistance, and information via telephone, electronic mail, and visitation at our various business sites. This unit operates the "Information Center" and "Help Desk." These two telephone hotline and walk-in service centers were components of the old organizations. Because of the allegiance our administrative customers have to the Help Desk, and the allegiance academic users have to our Information Center, we created an umbrella unit, the Computing Support Center. Though it is not obvious to either constituency, were are integrating staff from the Information Center and Help Desk, to create a staff with broader knowledge and provide back-up personnel in each area. Specifically, if we have an absentee at the Help Desk, a staff member from the Information Center can substitute as easily as another member of the Help Desk staff. We gained depth and breath without adding staff.

Cluster Consulting Services provide technical consulting, assistance, and information (primarily via on-site staff, but also by telephone and electronic mail) at the Bloomington campus public computing sites. We currently operate 24 such facilities, typically containing 25 workstations and assorted software. These public facilities are the focal point for assisting students with both workstation and central system hardware and software problems. With few exceptions, staff are students themselves, from a variety of disciplines, working their way through school.

Departmental Consulting Services help academic and administrative departments plan for computing technology, secure funding for computing technology, and arrange chargeback services to meet departmental needs. Both the academic and administrative organizations performed these functions before the reorganization, but each claimed that the other approached these tasks incorrectly. Specifically, the administrative organization believed in extended planning efforts, while the academic organization was more action-oriented. It was rumored that staff from Information Services held meetings to "plan for planning," while academic staff members prided themselves on their "paperless" offices. As part of the reorganization, administrative staff members agreed to teach the academic staff how to write planning documents, and the academic staff to teach the administrative staff how to dust shelves. (Administrative staff thought you dusted shelves by throwing away the top layer of planning documents.)

IUPUI Support Services serves as the primary liaison for users at the IUPUI campus and campuses in the northern half of the state. It also provides front-line consulting and referral services for users of our central systems and is responsible for Computing and Network Systems functions at IUPUI and the northern campuses.

Prior to reorganization, both administrative and academic organizations held significant support burdens. As a consequence, technological innovation was often done on the margin, even among those charged with it. For example, on the academic side, the graphics specialist was drafted to work two days a week on the front line at a microcomputer support center, reducing the support burden at that site. A global plan for graphics was never developed and innovation was a function of which user screamed loudest and longest for a new graphics application.

The reorganization provided the perfect opportunity for a shift in priorities. A Workstation Unit was formed with its own associate director, providing a focus for workstation innovations for the first time. In the strategic plan document is listed the objective: Build a workstations unit. We will continue to unify the expert staff to plan, develop, and support the workstation-based technologies that are essential to a distributed computing environment.

We made a concerted effort to enhance the technology units of the new organization, sometimes at the expense of the support units. For example, unfilled vacancies from the two separate organizations were "frozen" during the restructuring period, and reallocated to two of the technology units (Workstations and Networks). Thus, while there were few new positions in the organization, old positions were in some cases redefined as "technology" positions.

While vacant positions were being redefined, the support service units were charged with distributing support. Two educational series were generated for people outside UCS who were charged with supporting the computing needs of their department. One series is a LAN Management Series, now in its third rendition; the other, a Workstation Series, released this fall. Their goal is to educate external support people to be able to meet most of their department's computing needs, and thereby help reduce the support duties of the support and technology units.

The potential for technological innovation was also enhanced by increasing the number of external support people, again reducing the overall support burden upon our organization, and ultimately freeing up the technology staff. This is not a novel solution. Any computing organization will admit that it could increase its potential for technology if funding could be found to add computing support staff to external units. What is new is that we achieved this at very low cost, with existing funds. We determined that for $100,000 we could hire approximately 8-10 graduate students and allocate them to external units. We would provide the training, when possible, and guarantee that these student employees had access to our technical staff. We scraped the $100,000 from the fat of our existing budget at a time

when none of our staff believed that we had any fat. Again, the net effect was to reduce the need for technical staff to supplement support staff, thus increasing the amount of time technical staff were devoting to innovation.

University Computing Services (UCS): An End User Perspective - R. Gerald Pugh

I should say now that I speak as one end user, not on behalf of all end users. IU is an institution of 92,300 on eight campuses with 3600 full-time faculty, so I'm not sure we could find anyone willing to try, much less succeed in representing all end users. The Registrar is as dependent on computing as any end user could be, and at IU-Bloomington, the residential campus with 35,500 students, has been since the early 1960s when we set up computerized registration and records. We've valued that dependence over the years and I begin with an illustration.

In 1982, we implemented an online schedule of classes at Indiana University-Bloomington in preparation for the online registration that followed in 1983. These systems were built for the administrative computer and network; there were charges for both access and video terminal use. This prohibited most academic units from making the best use of the schedule of classes and registration systems in course schedule advising and in determining the department offerings and class sizes. Most academic units had plenty of terminals, but they were a part of the academic computing network for which there was no service charge. Since building the schedule of classes and registration are proxy activities conducted by the Registrar for the academic units, it was ironic that this dual network arrangement prevented faculty from seeing online student registration choices in comparison with their schedule of offerings. Some departments bought access to the administrative network but felt bitter about having to pay extra for limited value; others used the daily paper reports which we provided but these were not a substitute for immediate information. Faculty advisors could not use the immediate class count information. Students preparing to register also had no computer access to the class information because they were a part of the academic network as well.

This illustration represents the administrative/academic computing dichotomy that existed with our technical environment. In under two years, organization and technology have worked to eliminate such barriers to access. In the first six months after the merger, efforts were made toward a high speed, university-wide generic network to interconnect all computing information resources and workstations. High on the list of issues was the creation of an Administrative Computing Needs Task Force of which I and several other users were a part. Participation and involvement were important first steps. The task force worked diligently and the report identified seven goals:

1. Institute an information technology environment characterized by responsiveness to clients and end users (also labelled primary users and beneficiaries). Establish mechanisms to meet their information needs, and help them develop new uses of information technology to enhance their administrative functions.

2. Develop, deliver, and support integrated systems that fulfill the information needs of students, faculty and staff, including decision support systems, academic support systems, and administrative support systems.

3. Develop and maintain a high-speed electronic network and support structure linking the entire university community. This infrastructure will include basic services provided to all network users, such as electronic mail and the ability to transfer data, text, and graphics between workstations and other network resources.

4. Provide for the maintenance and enhancement of the existing administrative data center and the administrative information systems.

5. Lead in assessing, evaluating, and implementing emerging technologies to improve information access and decision making in departments. Encourage and promote entrepreneurial behavior in information technology and cooperative ventures between University Computing and the computing users in other departments.

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6. Review the current funding model for administrative information processing. A reasonable plan for financing, subsidizing and charging for information technology services is essential to the success of the University Computing enterprise.

7. Establish an advisory group (or groups) to identify the needs of the many different types of clients and end users, and help set policies and priorities for the administrative computing function within the university.

It is significant that such a task force of users was convened to address administrative computing needs and that they were given a charge to cover what needed to be addressed in their report. It is also significant that Dean McClure heeded the report; the recommendations became a part of the organization's strategic plan; and now the recommendations are being or have been implemented as a part of that operating plan.

From this, I see the following five initiatives of major importance to users:

1. Current service levels for activities on the administrative mainframe are being maintained and, in some ways, enhanced. Stated another way, to do more and to implement change, no matter how desirable, we must still be able to maintain system reliability and response time. We depend toc much on operational systems to consider alternatives. Further, the argument of suffer now for gains later is not acceptable in this period of consumer attention. Capacity and reliability must be in place before new systems are implemented, not after.

2. Vision is based upon advisory groups and staying close to the customer. The Administrative Computing Needs Task Force gave way to the standing Administrative Computing Advisory Committee with sub-groups for such tasks as identifying priorities and approvals for administrative systems development projects. Two other task forces have also been at work: the Access to University Information Task Force and the End User Computing Task Force.

3. The effort is to make information accessible. I've spent most of my working life trying to marry technology with task and promote the use of information for better decision making. It is critical to users that our computing partners share this goal of accessibility. The Access task force has made more information available to faculty, staff, and students. We can now develop, implement, and operate systems for computer-assisted advising, registration, class schedule adjustment, grade reporting, address collection, and transcript ordering, among others, which can be accessed through the entire terminal network on campus and through dial-up methods, making it possible for students, faculty and administrators to retrieve information and perform academic support tasks from the same devices used for teaching and learning. We are in fact now doing this with the degree audit record, student directory, and schedule of classes. We are currently working on approved projects for extending our online registration through all campus terminals and dial-up modes.

4. The emphasis today is on partnerships — with beneficiaries, primary users, developers, maintainers, data stewards, and executive management. As Dean McClure has noted, "the unit for which the system is being developed needs to take the lead in defining the tasks the system will perform and the way it performs them." The needs task force noted that technical skills are becoming so pervasive and needs so great that all systems development cannot be funnelled through a single group of programmers/analysts at the computing center and the university's work get done. There is a backlog of projects and it's gaining on us: this trend will continue unless we use more and more of all available people to fulfill the goals. The End User task force identified ways to permit technically capable, non-computer-center staff to do more systems maintenance development.

5. The new computer organization reflects the vision of the future as outlined by the task forces and the computing strategic plan. Many people now have new jobs, different jobs, or modified jobs. Culture clash and resolution have occurred as two quite different organizations were put together. Those of you who heard the Indiana University presentation at CUMREC last May have a real sense of the dimensions of these differences. I think some users have also had culture clash problems as some academics think that

administration will consume more of the computing resource and some administrators think academic and research concerns will overshadow administrative mission-critical tasks for the operation of the institution.

Are there some problems noticeable to users? Yes.

New Demands -

As we make more information available to users of the academic network, faculty, staff and students are able to take a more active part in decision making. Users of information that is becoming available are creating a considerable demand on the academic computing network. Our increased client base has caused a decline in the ability of the academic network to deliver the computing power required for increased accesses.

The time-dependent nature of the information delivered in support of ongoing service demands and decision support systems represents a new dimension in the academic computing environment. The reliability of the administrative computer for online production systems may be overshadowed by the inability of the academic computers to support the demands of the information users.

Hardware and Network Support -

During the UCS merger staff and management responsibilities shifted from one group or manager to another. There was often difficulty in obtaining information and delivery of certain services. This was particularly true in the areas of delivering computing hardware and obtaining network connections.

The demands on general help and support staff at UCS have also increased as a result of the merger. Because the technical nature of the academic and administrative computing environments differs significantly (VAX vs. IBM), support staff from both former organizations must now anticipate a much broader range of questions from clients who may know the information but are unfamiliar with the new access paths or vice versa. The merging of the two environments has not yet filtered down to all levels of the organization, particularly to those who are in daily contact with users and who require immediate response to technical questions and problems related to access.

User Application Support -

As information delivery systems were offered across the academic network, it was not clear to clients whom to call for help with applications. The new clients (faculty/students) were not (and are not) used to calling the administrative support staff for help, and the academic support staff are still not trained in the applications being used.

Effects of Size -

The new organization is very large and the management structure is commensurate in size as well as complexity. Inevitability, size creates and dictates a more complex environment. Communication with 250 people is more difficult than communication with 100.

Some concerns for the future as we move forward.

Client Support -

As our applications are made available across the academic network, UCS and administrative offices will increase the number of clients they serve via online computer applications. This will create the need for new types of security procedures and client support structures, and create demand for more sophisticated information retrieval. The information provider (Administrative Office) and the messenger (UCS) will need to act as partners to successfully deliver effective information systems to students, faculty and staff.

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Distributed Computing -

Greater availability of computing via PCs and desktop workstations has created the vision of a distributed computing environment. Identifying and using this technology needs to be carefully considered.

End User Development Tools -

UCS needs to provide development tools for the rapid generation of user-developed administrative applications. The tools should enable the user to easily create ad hoc information reports and create transaction-based applications for the support of their own administrative functions. In addition, UCS personnel should support and be able to maintain applications developed with these tools.

Integrated Data Architecture -

UCS should be the technology leader in the development of new data architectures. Implementation strategies should include the smooth migration from one architecture to another.

Balance Between Technology and Service -

UCS must strive to keep in balance the services required to meet the varied needs of users and beneficiaries as well as keeping up-to-date with new technology. Too much or too little emphasis in the service direction can result in too little or too much being spent on new technologies.

Are we where we want to be? Not yet, but I believe, from the user's perspective, the pieces are in place to get there.

Conclusions and Lessons Learned - Polley Ann McClure

We have learned a lot from this reorganization. It has been expensive. Direct costs (interview expenses, moving staff offices, consultant fees) totalled about $257,00. Organizational planning costs (time spent in planning meetings and developing the architecture documents) reached $136,000. Unit planning (time the associate directors and their staff spent creating the new divisions and establishing unit responsibilities) cost $252,000. "Salary creep" from our attempt to increase the professional/technical level of the staff came to $444,000. This included new hires with higher salaries and promotions for some stars. The total came to about $1 million — about 4% of our budget. These may be minimum costs, but we did not write out a check for this amount. To some degree, the time spent on the planning and organizing could otherwise have been available for other work.

We were concerned that we would experience significant loss of staff during this process. The amount of change, the uncertainty about the future technical directions of the organization, all could have generated significant losses. We are pleased that this did not happen. The turnover rate during the year of reorganization was in the range of the historical trend the previous three years in the two former organizations.

We noted a number of other kinds of costs. One, of course, is stress — a significant cost to users as well as to staff. (I gained about 5 pounds!) Another category I call navel gazing — the tendency on the part of staff to develop an introverted and contemplative posture and dwell on the belief that they and this organization are the most interesting and most important thing in the university. I believe we are now past most of these high-cost activities.

On to some benefits. Some we hoped for when we began the merger, but others we didn't anticipate. First, we did meet our service obligations during the merger. The paychecks were delivered. (The 747 did indeed land in New York!) Second, the library project was completed on time and within budget and in a context of an open network. When the library catalog went public, individual professors accessed it through the campus network from their offices. The network may be the most visible and important benefit of the merger to date. Though the network is incomplete, campus awareness about its purpose is significant and people appreciate the services alread, delivered. Another benefit: we have adopted a hybrid strategy for relational database technology, including a relational product on the administrative mainframe and an alternate platform as a front-end for data access. In a project called "Workstations for Administrators" we're introducing to a very conservative arm of the university — the division of

finance and administration — the benefits in work style and productivity that characterize the networked workstation environment becoming prevalent in our academic units. We have installed Mac IIci's on the desks and in the homes of the top executives and their assistants in this division and we are about three-quarters of the way through a major training program for them. We are seeing significant excitement in that group.

Other benefits were more subtle. We got a rare chance to do a ground up technology and service redesign for our organization. If you have that chance, seize it with relish. Further, our visible planning and reorganizing opened new communication with users — they're very interested in what you are doing (very concerned that you don't mess up their environment). Another benefit may not be initially apparent. In both original organizations we had neglected some personnel problems that had been too nasty to deal with. The personnel reassignments that came with the reorganization made it easy to resolve these without harming the individuals. Finally, such change gives us all a chance for professional growth. Most staff benefitted, and women did disproportionately, not through deliberate activity on our part, but because we had excellent women, qualified for advancement. These changes allowed them to move forward, unencumbered by whatever had constrained their promotion in the old organizations.

The most important observation I can make is this: widespread participation from outside and inside the organization is critical to success. The openness of this process carried some cost, but the benefit is that everyone feels that they had a chance to take part, and they have some stake in the result of the process. If you are after organizational change for the long term, this investment in participation is essential.

Second, the senior executive leading this process must allot enough time — this cannot be delegated. You must play a visible, active, full-time part to assure your staff that the process is working. Once you announce a new organizational structure, managerial and director-level staff abrogate almost all decisions until their new assignments are secure. This means all decision making, important and trivial, gets bounced up to the Dean's office. During its height, I spent 70-80 hours a week working on just the reorganization.

Third, focus in advance on the mechanics of organizational change. (We could have handled this better.) If we had it to do again I would appoint one operational committee in each former organization. Beginning on the first day of the planning process they would document in writing and flow charts the processes their organizations used to deliver their main services. (For example: Where do users establishing new accounts make their requests, and what steps are involved in delivering the services?) The operational committees would use these data to draft new processes. We did not do this, and the new owners of responsibilities spent considerable time developing new procedures on the fly.

Fourth: if you want to promote radical change you have to change things radically. Our customer/user/advisory groups early on let us know of very significant changes they wanted — changes that wouldn't have been possible to generate in the near term in the context of the two old organizations. We had to start from scratch to allow ourselves the focus on new directions. That's expensive, but the only conduit to the profound changes we wanted.

Finally, organizational evolution is never finished. The time between making the decision to the time that we had a new, forward-moving organization in place was about 18 months.

This big, complex business of reorganizing computing services at Indiana University into one unit was one of the hardest things I personally have tried to do, and one of the most rewarding. As we began the process I ran across a little book by Robert Fulghum called *All I ever really needed to know I learned in Kindergarten.* I read it for fun but came away with the perspective that I think put our efforts in the proper place. I realized that many of the principles we needed to employ in our reorganization were indeed very simple, even childlike. Things like "Don't hurt other people," "Clean up your own messes," "Hold hands, stick together and look before you go across the street." The processes we described here are about serious, important issues. But through them ran a thread from Fulghum's essays. We did our level best not to lose sight of the basic human needs of the people affected by our reorganization and we believe that was a major factor in our success.

Developing a Circle of Services for Microcomputer End Users: A Cost Effective Approach

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The Circle of Services for microcomputer end users at Bowling Green State University consists of the following four quadrants: 1) BGSU Microcomputer Resources Handbook, 2) Microcomputer End User Roundtables, 3) Microcomputer/Networking Feasibility Studies, and 4) External Microcomputer Resources. Each quadrant is based on a foundation of customer service, and feedback from the user community indicates that the proper foundation has been established.

Emphasis is placed on the goals associated with each quadrant within the Circle of Services. In addition, procedures for developing each of the service components is presented.

The wealth of microcomputer knowledge at many institutions is tremendous, and organizational and personnel strategies can be established to "tap" the existing resources. Such a cost effective approach allows the development of microcomputer end user services without the addition of major staffing commitments.

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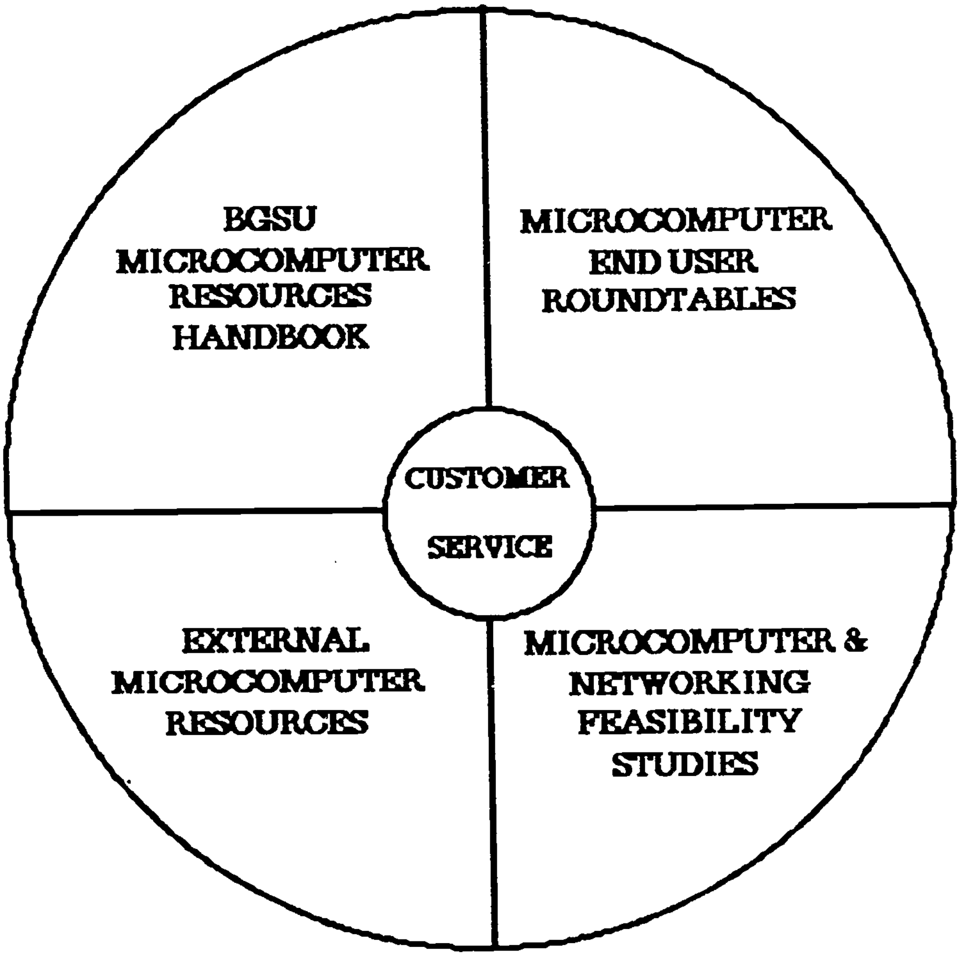
Developing a Circle of Services for Microcomputer End Users: A Cost Effective Approach

Introduction

The Circle of Services for Microcomputer End Users at Bowling Green State University consists of the following four quadrants: 1) BGSU Microcomputer Resources Handbook, 2) Microcomputer End User Roundtables, 3) Microcomputer/Networking Feasibility Studies, and 4) External Microcomputer Resources. Each quadrant is based on a foundation of customer service, and feedback from the user community indicates that the proper foundation has been established.

DEVELOPING A CIRCLE OF SERVICES FOR MICOROCOMPUTER END USERS



This paper focuses on the goals associated with each quadrant within the Circle of Services. In addition, procedures for developing each of the service components is presented.

BGSU Microcomputer Resources Handbook

"I'm sorry, that is not a supported product." How many times have centralized microcomputer support personnel made that statement to end users needing assistance? At Bowling Green State University, that response is changing.

Today, the request for help for non-supported microcomputer hardware and software generates the following reply: "Even though that product is not supported, we have a directory of 156 on-campus microcomputer resource persons who have volunteered to assist other users."

Goals

Handbook Goals. The primary goal in the development of the BGSU Microcomputer Resources Handbook was to develop a comprehensive listing of all classified staff, administrative staff and faculty along with their areas of microcomputer hardware and software expertise. Secondary objectives included a desire to maximize limited human microcomputer resources in a university environment and to promote the decentralized concept of users helping users.

Procedures

Exploring the Unknown. Since this was the first attempt to establish a directory of users' microcomputer knowledge at the University, unknown territory was being explored. The entire project revolved around the user community's willingness to be listed as microcomputer resource persons in an inaugural publication. Whether 1 or 100 people would respond to the Handbook survey could only be determined by giving it the "old college try". The response was tremendous as evidenced by some of the statistics cited later.

Survey Instrument. After going through multiple revisions, a final Handbook survey form was devised. The dual-purpose survey was designed to capture users' knowledge of products centrally supported by University Computer Services as well as non-supported products.

A checklist of supported products comprised the front page of the survey so users could quite easily check those hardware and software products for which they would be willing to be identified as microcomputer resource persons. The back page of the survey contained a few samples of areas of microcomputer expertise for non-supported products along with ample space for filling in the "Type of Microcomputer Expertise" along with a "Description". The survey also requested the user's name, department, and campus phone.

Since the goal of this project was to develop a comprehensive listing of all BGSU personnel and their areas of microcomputer expertise, the survey was sent to all classified staff, administrative staff and faculty. From the diversity of responses, it is apparent that microcomputer expertise resides in all segments of the University community.

The Incredible Response. Thanks to the user community's unbelievable willingness to share their microcomputer hardware and software knowledge, the BGSU Microcomputer Resources Handbook has evolved into a 23 page document consisting of feedback from 156 individuals representing 985 individual entries. Furthermore, a total of 233 hardware and software products are listed in the publication. It should be noted that 23 hardware and software products were supported at that point in time. That is, users volunteered to be microcomputer resource persons for an additional 210 non-supported products!

Putting It Together. With 156 survey forms sitting on my desk, the notion of taking a concept and turning it into reality seemed formidable. A project that was quite unknown in the beginning had been transformed into a potential tremendous resource for the institution. Now, the task of getting all the data into a user-friendly format had to be tackled.

With a trusty word processor, extensive use of copy and paste, and phone calls to users to determine appropriate categorization of certain products, the formidable task became manageable. Each respondent's survey was entered on a product by product basis into a two column format that evolved into the body of the Handbook.

In an attempt to make the document user-friendly, both a table of contents and an index were included. If an individual wants to identify a resource person who has worked with certain types of printers or specific kinds of spreadsheets, the table of contents provides an easy reference. The index is an alphabetical listing of product names contained in the Handbook. If one is seeking a resource person for a particular hardware of software product, the index serves as a quick reference.

Striving to minimize costs, all copies were completed in-house. Furthermore, an inexpensive plastic backbone was used as opposed to binding. With the foregoing cost-cutting measures, the paper costs, cover development, and "binding" totaled 30 cents per copy!

Distribution. Once the publication was finalized, distribution became the next task. The intent was to provide wide enough distribution to promote the use of the publication without sending duplicate copies to individuals or areas. A database consisting of all academic departments, administrative offices, the 156 microcomputer resource persons who volunteered to be in the Handbook, selected University Computer Services personnel, attendees of monthly Microcomputer End User Roundtable meetings, the President, Vice Presidents, Deans, Planning and Budgeting Directors, Chair of the Faculty Senate, and members of University Computing Council was formed. Each person in the database received a cover letter from Dr. Richard Conrad, Director of University Computer Services and Telecommunication Services, along with a complimentary copy of the Handbook. A total of 408 Handbooks were distributed throughout the University community.

Publicity Campaign. As with the compilation of any handbook, the ultimate value of the publication is determined by its use. In an effort to promote the use of the

document, a small publicity campaign was developed. A feature article on the goals of the BGSU Microcomputer Resources Handbook was run in the Monitor - the campus faculty and staff weekly newspaper. The University Computer Services Bulletin also included an article on the development of the Handbook.

Furthermore, the Handbook was promoted at the following campus groups: 1) Microcomputer End User Roundtables, 2) University Computing Council, 3) Faculty Senate, 4) Administrative Staff Council, and 5) Classified Staff Council. The publicity campaign not only enhanced the use of the Handbook in the user community but also fostered the services image of Computer Services.

Campus Reaction. The reaction to the inaugural publication of the BGSU Microcomputer Resources Handbook has been quite positive. Numerous requests for additional copies have been received, and users have characterized the Handbook as extremely helpful. The old statement: "I'm sorry, that is not a supported product" is on the way out at BGSU, because a publication that maximizes limited microcomputer human resources has evolved from a concept into reality.

Handbook Conclusion. When trying something new, the outcome is always in doubt. In this case, questions about "Will we get enough responses?", "Should we focus our efforts on a few, centrally supported products?", and "Will the Handbook actually be used?" have been answered. As Carole Barone said in the Fall 1988 issue of CAUSE/EFFECT:

> Balance of central versus distributed functions with access to centrally provided support will furnish the most responsive computing environment when it is founded on carefully considered, articulated, and understood policy, goals, and procedures.

The cost effective approach taken at Bowling Green State University will work not only at institutions of higher education but also at any site where personnel are willing to share their knowledge of microcomputer hardware and software.

Microcomputer End User Roundtables

Is there a way to develop an informal setting to foster person to person communications among microcomputer end users and provide general information of common interest? The answer to this question became the basis for the establishment of Microcomputer End User Roundtables at BGSU.

Goals

Roundtable Goals. The following three customer service oriented goals have been achieved via the Roundtable concept: 1) obtain answers to questions on selected "Spotlight Topics", 2) share ideas regarding microcomputer "happenings" on campus, and 3) get to know other microcomputer users.

ERIC

Procedures

Getting Started. To determine the degree of interest in the microcomputer user community for the concept of Microcomputer End User Roundtables, the first step was getting the word out about the first organizational meeting. By means of a mailing to budget administrators, an article in the Monitor, and an announcement in the University Computer Services Bulletin, a nucleus of 20 individuals representing 18 different offices attended the first meeting.

Initial Meeting. The first meeting of the Roundtable was essentially a brainstorming session where microcomputer users were given the opportunity to generate a variety of topics as possible "Spotlight Topics" for future Roundtables. In addition, participants at the initial meeting offered suggestions regarding the structure including frequency and length of Roundtable meetings.

A Typical Roundtable. From the outset, microcomputer users provided input on how the Roundtable would evolve and what topics were of interest. Today, a typical Roundtable has three basic components. First, time is taken for each person attending to introduce themselves and the office they represent. This approach is directly related to the original goal of giving microcomputer users the opportunity to know other users on campus.

Second, the "heart" of each Roundtable is a "Spotlight Topic" in which an informal panel of on-campus resource persons (many times identified from the BGSU Microcomputer Resources Handbook) presents general information on the topic for that particular day.

Third, time is reserved near the end of each meeting for the "Good of the Order". This gives anyone attending the opportunity to share microcomputer "happenings" that might be taking place on campus or simply share some microcomputer experience in his/her office setting that might be helpful to others.

Channels of Communication. In an effort to keep the channels of communication open and to expand participation to other persons and offices, "Summary Notes" are distributed after each meeting to everyone on the Roundtable database. Also, each upcoming meeting is promoted via an article in the Monitor and by a direct mailing, with a flyer for posting, to individuals on the database.

Spotlight Topics Presented. Since the Roundtables are only held during the academic year, the following list indicates the Spotlight Topics covered to date.

Software Selection
Networking
Desktop Publishing
Viruses
Academic Year-End Review
Hardware - Top 10 Troubleshooting Tips
Software Seminars, Classes, and Other Training Opportunities
Ergonomics - The Science of Adapting the Working Environment to the Worker

Roundtable Statistics. Currently, seven monthly meetings are held during the academic year. From the first meeting of 20 participants, the Roundtable database has grown to 102 individuals from 62 different offices on campus. Average attendance so far this year has been 32 per meeting.

Roundtable Conclusion. Users not only determine the content of the various "Spotlight Topics", but also benefit from the exchange of information that occurs at the monthly meetings. User needs are being met in a decentralized customer service oriented manner. Furthermore, with the use of on campus resources, the Microcomputer End User Roundtables are essentially a "cost free" proposition.

Microcomputer and Networking Feasibility Studies

At Bowling Green State University, there is tremendous variety among offices in terms of microcomputer and networking equipment and expertise. At one end of the continuum are those few small offices that are just getting microcomputers. At the other end of the continuum are a few offices with quite sophisticated equipment that are transferring electronic data to various locations via InterNet. Between these two extremes are many offices that are at different points along the continuum.

Recognizing the degree of microcomputer and networking diversity at the institution, the task of providing assistance to areas desiring microcomputer and networking feasibility studies is quite formidable.

Goals

Micro/Network Feasibility Study Goals. For those offices requesting a microcomputer feasibility study, the primary goal is to help personnel in the office make informed decisions regarding computerization. For areas seeking a networking feasibility study, the main objective is to provide assistance so logical networking decisions within the campus framework can be made.

Procedures

Getting the Word Out. Since microcomputer and networking feasibility studies were a new service offered by Computer Services for the first time in May of 1989, one of the first tasks was to let the campus community know that such services were available. Announcements at Microcomputer End User Roundtables, an article in the University Computer Services Bulletin, and word of mouth was more than sufficient to inform users of the new service.

Microcomputer Needs Assessment Instrument. Assessing the needs of an office is the first step to assist those areas requesting a microcomputer feasibility study. In an attempt to provide comprehensive service and gather all the necessary data for the study, a Microcomputer Needs Assessment Instrument was devised. A total of 30 data gathering questions are asked in the following categories.

Statement of Objectives

6

Analyzing Information Requirements
Software Considerations
Hardware Considerations
Human Resources
Cost/Benefit Analysis

After answers to the various questions have been obtained, research is then conducted using resources within Computer Services as well as other resources on campus and off campus when needed.

Microcomputer Feasibility Study Report. The culmination of the data gathering and research is the final written report to the office initiating the request. Although the specific information provided varies substantially from one office to the next, the Microcomputer Feasibility Study Report contains the following general headings.

Defining the Needs
Primary Need 1, 2, Etc. Including Costs
Secondary Need 1, 2, Etc. Including Costs
Application Software
Hardware Options
Microcomputer Changes
Computer Services Contacts

Networking Needs Assessment Instrument. For areas considering networking, the current hardware and software environments as well as the potential uses of a network must be ascertained. In order to determine pertinent information, a Networking Needs Assessment Instrument was developed. Thirty-two specific questions in the following categories are asked to appropriate personnel to gather the necessary information.

Statement of Objectives
Analyzing Communication Requirements
Software Resources
Hardware Resources
Human Resources
File Server Options
Network Layout

Upon completion of the Networking Needs Assessment Instrument, various internal and external resources are used to prepare a final Networking Feasibility Study Report.

Networking Feasibility Study Report. Although the networking needs and solutions vary from one office to another, the basic ingredients of the Networking Feasibility Study Report consist of the areas identified below.

Defining the Needs
Primary Need 1, 2, Etc. Including Costs
Secondary Need 1, 2, Etc. Including Costs
Software Considerations

Hardware Considerations
Networking Layout Diagram
Networking Changes
Computer Services Contacts

Microcomputer and Networking Feasibility Study Statistics. The first year Microcomputer and Networking Feasibility Studies were offered as a service to offices on campus. 28 areas made requests and ultimately received reports. Of these studies, 13 were classified as microcomputer studies and 15 were networking studies. Of the 12 studies completed at this point in time in the fiscal year, 10 have been networking studies and only 2 have been microcomputer studies. The trend at BGSU is definitely toward networking.

Micro/Network Feasibility Study Conclusion. The implementation of Microcomputer and Networking Feasibility Studies has broadened the customer services philosophy of University Computer Services. Users have provided positive feedback about the time taken to "truly understand" their microcomputer and networking needs. An indirect spinoff benefit has been the opening of communication channels allowing users to better understand the benefits associated with the most popular local area network on campus.

External Microcomputer Resources

This is the only component of the Circle of Services for Microcomputer End Users that is still evolving. The intent is to take existing publications obtained by Computer Services and make them available to offices that cannot justify the costs.

Goals

External Microcomputer Resources Goals. The primary goals in making External Microcomputer Resources available to end users are to develop a microcomputer library of selected publications and to serve users by providing information from Datasources.

Procedures

Developing the Microcomputer Library. Various personnel in Computer Services receive numerous free, and some paid, subscriptions to many different publications. Historically, the magazines and journals were routed to selected personnel within Computer Services and ultimately sent to the Science Library for shelving or destruction. Today, selected publications are routinely categorized and housed in the Administrative User Services office. At no cost, a resource is being developed for end users.

Informing the User Community. Now that twelve months of various publications have been collected, some standard methods will be used to inform end users about the existence of the Microcomputer Library. Announcements at

Microcomputer End User Roundtables, a mailing to the Roundtable database, a statement in the Monitor, and an article in the University Computer Services Bulletin will be utilized to get the word out.

Selecting Publications. Since there was a human resources limit as to the number and volume of publications to be retained for possible reference by the user community, there was an arbitrary decision to keep only a limited number of magazines and journals for a limited amount of time.

Since Computer Services centrally supports IBM and MAC products and since Microcomputer and Networking Feasibility Studies had identified the types of needs in many offices, publications were chosen in the following categories: 1) General, 2) IBM-Oriented, 3) MAC-Oriented, 4) Networking, and 5) Office-Oriented.

The following 17 publications are retained in the Microcomputer Library. General magazines and journals include Computerworld, Datamation, Information Week, Infoworld, and MIS Week. IBM-oriented publications are PC Magazine and PC Week. MAC-oriented resources are MacWeek and MacWorld. Networking items include Communications Week, Connect, LAN, Network World, and Networking Management. Office-oriented publications are Modern Office Technology, The Office, and Today's Office.

Datasources as a Resource. Datasources is a comprehensive guide to available data processing and data communications hardware, software, and companies. Computer Services had subscribed to Datasources for some time using it primarily for internal purposes. It became an invaluable personal resource tool while compiling the first BGSU Microcomputer Resources Handbook.

The intent is to provide the following types of information when users have specific needs that cannot be met by internal campus resources: 1) brief product descriptions, 2) configuration requirements, and 3) 800 phone numbers for possible contacts. Thus, an existing resource will ultimately serve as an aid for end users with specific needs.

External Microcomputer Resources Conclusion. Although the External Microcomputer Resources quadrant of the Circle of Services is still evolving, the Microcomputer Library and the expanded use of Datasources will hopefully enhance services provided to the end user community.

Project Accounting Related to the Four Quadrants of the Circle of Services

What time and effort is being devoted to the user community in terms of the four quadrants contained within the Circle of Services? In an attempt to provide the Director of University Computer Services and Telecommunication Services an answer to this question, a monthly report format was developed.

Project Accounting Goals. Two goals were articulated during the development of the project accounting procedure. First, all project activities associated with any of the four quadrants should be contained in the monthly report. Second, a "user-friendly" standardized synopsis of the amount of effort devoted to various tasks should be included.

Procedures

Supporting Documentation. In order to track the necessary information to summarize in the monthly report, three documentation techniques are used. First, a daily log is maintained that categorizes the type of activity, identifies the amount of time devoted to a task, and contains a brief description of the activity. Second, a monthly project list is derived from the daily logs. Third, a spreadsheet reflecting the hours spent in each category is kept.

Monthly Report. Using the three documentation techniques as sources of information, the monthly report is prepared for the Director of University Computer Services and Telecommunication Services. Descriptive information, as well as a pie chart showing the percentage of time spent in each category, is summarized. The report categories include:

Hardware
Software
Office Projects (Micro & Network Feasibility Studies)
External Microcomputer Resources
BGSU Microcomputer Resources Handbook
Microcomputer End User Roundtables
Meetings
General Reading
Miscellaneous

Project Accounting Conclusion. The monthly report not only serves as a project accounting mechanism but also as a method for informing higher level administration about the level of customer service support being provided to end users.

Summary

How can support be expanded to microcomputer end users without major expenditures? Can informal settings be developed to foster person to person communications among microcomputer users? Is it possible to serve diverse offices attempting to meet their microcomputer and networking needs? Can existing centralized publications and other resources be organized for utilization by end users? At Bowling Green State University, the Circle of Services that is based upon a foundation of customer service results in affirmative responses to each of the above questions.

Bowling Green is not unique in terms of human resources. Many colleges and universities have a wealth of microcomputer human resources waiting to be "tapped". Developing appropriate organizational and personnel strategies based upon sound goals and procedures can result in maximizing the potential of those resources in a cost effective manner.

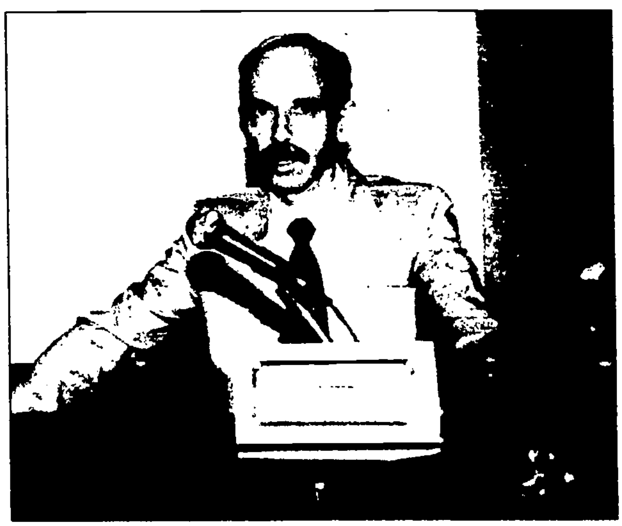
CAUSE90 MIAMI BEACH NOVEMBER 27-30, 1990

TRACK IV

POLICY AND STANDARDS

Coordinator: Jacqueline Brown, Princeton University

Policies and standards can help us stretch fiscal and personnel resources to meet expanding demands for access to information resources. Topics addressed in this track include data administration, computing access, involvement of constituencies in policy making and enforcement, and institutional standards for departmental systems.



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ERIC

Evolution of a Computer Security Policy Process and Outcome

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Prepared for Presentation at
CAUSE90
Miami Beach, Florida
November 28, 1990

Evolution of a Computer and Data Security Policy --Process and Outcome

BACKGROUND

Twenty years ago, as a professor on the University of Michigan Law School faculty, Arthur R. Miller wrote about the uses and abuses of the then somewhat new information technology in his book *The Assault on Privacy--Computers, Data Banks, and Dossiers.* He wrote, "No people in the world are scrutinized, measured, counted, and interrogated by as many poll takers, social science researchers, and governmental officials as are Americans." Professor Miller's book followed closely the debate in 1967 about a proposed National Data Center.

Thirteen years ago, the report of the Privacy Protection Study Commission submitted its final report on "Personal Privacy in an Information Society" to the then President of the United States, Jimmy Carter. The commission was created by the Privacy Act of 1974 and emphasized the public sector during the course of its study and addressed the issues of personal privacy in the public sector as well. From each of these efforts it is not only reasonable, but imperative to conclude that the ever-increasing capabilities of information technology may run counter to a constitutional right to privacy endowed upon each and every American citizen.

The issue of creating countermeasures, i.e. technological security systems, to counteract unwarranted infiltration into more and more technologically sophisticated information handling systems seems at best an endless occupation of time and energy. Indeed, it is an endless pursuit for which patience, diligence, and tenacity. provide the only vehicle.

One only has to look at the computer security industry which has sprung-up around the information technology industry in the past twenty years to realize that the threat to personal and proprietary privacy is a real and serious modern socio-logical phenomenon of the latter part of this century. So, what is going on, anyway? In some real sense, the purveyors of technology in the information handling environment in which most of us are engaged become the first members of our society to recognize the threat to their own "personal privacy." The fear and knowledge of this threat prompts the information technologists to respond positively when the non-technologist (i.e. the social and political scientist, the lawyer, the business manager as well as others from non-technological venues) inquire into the "safeness" or security of both personal and (corporate) proprietary data.

Nowadays when someone asks about "security of data" they usually refer to that information (policies, procedures, programs, and data) that is processed "on a computer." Further, these same inquirers usually are talking about that information which is entered into, processed, stored, and retrieved from the "central computer" or "the corporate data center" or "the mainframe." The important point here is not the terminology but the fact that when the non-information technologist raises the specter of information security or the lack thereof, that person: (a) is really concerned about a potential privacy invasion and (b) has a receptive audience in the person of the technologist.

Computer and data security have, indeed, long been the province of the technologist. Auditors have not been concerned about information privacy, computer security breach, computer virus invasion, or database invasion nearly as long as the computer scientist or information systems professional. This is no longer the case, however. The auditors have discovered a fertile ground for plying their trade and in the process have created perhaps one of the fastest growing career paths for both the traditional auditor as well as the information technology professional.

At Carnegie Mellon University, the need for improved security in and around the data and information systems has been highlighted by a confluence of three separate interests. The first of these is the interest in, responsibility for and authority over the central computing environment through which most of the University's "business" data flows. This interest, responsibility, and authority comes from the view of the technologist, those responsible for the hardware, software, and applications which reside predominantly "in the data center machines."

Almost simultaneously, the University's external auditors began to raise questions about the security or lack thereof of business data, the absence of clear cut university policies and procedures (governing the protection of privacy and security of information), and the vulnerability of the data center to various types of disaster.

At the same time various members of the University's Board of Trustees had, predictably, heard numerous horror stories about the Internet worms, hackers, computer viruses, and last but not least, "Robert T. Morris"[1] . These trustees, mostly "non-technologists," and some CEOs of prominent U.S. firms, began to question the University's degree of readiness to ward off a potential attack on the information resources of the University. These were and are imperative concerns. The information systems technologists who had quietly been creating countermeasures at the operating system, database management system, and application-level finally received support and demand for those efforts (for the first time.) The auditors and the trustees provided the business reason to formalize what the technologists had created but had not yet fully documented into formal policies and procedures.

The effort to create a security policy actually began in 1988 in an attempt to document the requirements for data security which applied to a new family of administrative information systems. About that time, the external auditors submitted their second annual report which cited the University for "the lack of a computer security policy." By this time, most of the Trustees had heard of Robert T. Morris and the internet worm of November, 1987.

The confluence of concerns over information privacy and the security of University business data by the non-technologists (auditors and trustees) and the technologists (information systems professionals) created the impetus to develop the security policy about which this paper reports.

A SECURITY POLICY: WHO NEEDS IT?

Can't we just concentrate on computer security and forget about the policy? This depends somewhat on who are the "we?" As stated earlier, if "we" are the technologists then "we" have been concerned about computer security; "we" have implemented numerous measures to secure the privacy of and proprietary right-of-access to the computer and its store of information. Clearly, the information technologists have implemented security measures usually within the operating systems to either prohibit or at least monitor acts of irresponsibility, probing or hacking and penetration.

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1 --In real life, Robert T. Morris, Jr. of Cornell University, Ithaca, NY, alleged perpetrator of the now famous November 2, 1988 Internet worm.

Database security via DBMS software and applications security via a separate layer of software represents still other attempts by the technologists to inhibit and monitor unauthorized acts against the data.

The security policy works as a two-way instrument of communication -- the documentation of the dialogue between the technologist and the non-technologist. The technologist participates in this dialogue by expressing in general terms the technical feasibility of securing the computer against unwarranted infiltration and compromise. The non-technologist can state fears and reservations as well as express management parameters against which security will be assessed. Parameters such as cost, complexity, and control are not uncommon even if not explicitly recited in a security policy.

These parameters, when viewed in the context of technical feasibility, become a medium of exchange between the technologist and non-technologist for arriving at a policy which is enforceable and cost-justifiable. An issue to ponder is that just as the securing of computer systems is neither inexpensive nor without opportunity costs, nor is the creation, selling, implementation, and enforcement of the policy. The policy itself takes time and effort to develop that might otherwise be applied to other initiatives.

Who needs it? Certainly the technologist needs it. A statement of security policy lends corporate or institutional credence to the security efforts of the technologist of the past 15 to 20 years. Further, the technologist knows that security is not free. Some hardware vendors have labored for years to protect sensitive information from unwarranted access and as a result added to the complexity and cost of the controlling software. Although not true in every case, vendors with proprietary operating systems tend to produce more secure computing environments than the so-called "open systems vendors." This trend is changing, however, with assistance of the federal government. In fact, one challenge for the next 10 years will be to secure "open" systems to the same or greater degree than existing proprietary operating systems.

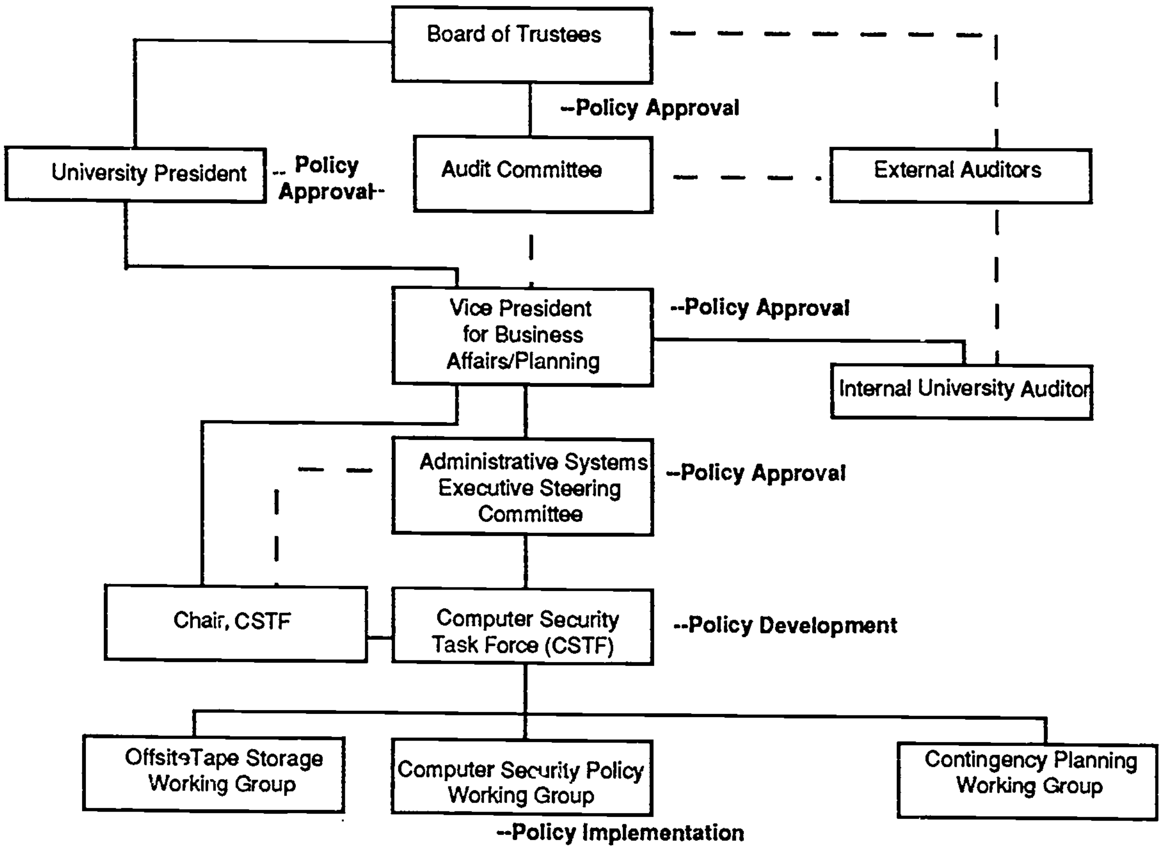
A SECURITY POLICY: WHO CREATES IT?

The genesis of the policy can be found in various comments from the external auditors (Deloitte Touche) as expressed in their management letters to the University over a two to three year period. Further, the trustee Audit Committee assigned the development of a University policy to the Vice President for Planning. Subsequently, a Computer Security Task Force was established to develop a policy covering and governing security of the University's administrative data and its administrative computing systems. The following staff were assigned to the task force:

- Project Director, Student Information Systems (Planning Division)
- Director, Administrative Systems (Planning Division)
- Manager of VMS Software (Academic Services Division)
- Assistant Director, Administrative Systems (Planning Division)
- Associate Director, Administrative Systems (Planning Division)
- Manager of Internal Audit (Business Affairs Division)
- Director of Business Systems (Business Affairs Division)
- Director of Enrollment Systems (Enrollment Division)
- Registrar (Enrollment Division)
- Director of Development Information Systems (Development Division)
- Director of Human Resources (Business Affairs Division)
- Manager, Operations and Special Projects (Academic Services Division)

The intent of the task force was to present an approved policy to the trustees Audit Committee on April 27, 1990. The Computer Security Task Force is also an outgrowth of the previously constituted administrative systems security task force created in 1987 and has been stimulated by the continuing concerns for security as expressed in the auditors' management comments of their past three audits of University operations. The Computer Security Task Force was also charged with development of an off-site Tape Storage Plan and Disaster Recovery (or Computer Contingency Plan). The organization put in place to develop the security policy, as well as these other two charges, is shown in Figure 1.

FIGURE 1. ORGANIZING TO CREATE A SECURITY POLICY



In addition to the organization which evolved to create the computer security policy, many other concerned constituencies were invited to review, critique and offer suggestions to the policy. The notion that any segment of the University was either inadvertently or purposely excluded from the policy development would be unlikely. All formal organizational channels of communication were utilized in an attempt to subject the policy to careful scrutiny. This careful scrutiny was deemed essential inasmuch as the resultant policy would have the full force of the Board of Trustees, the President's Office, and the Dean's Council behind it. Further, the policy carries with it significant authority for disciplinary action in the event of willful violations of the computer or data security rules and regulations. Therefore, the time-consuming review and evaluation of the policy as it evolved was deemed appropriate by the formal organization charged with the policy's development. The constituent groups and individuals who participated in the review and evaluation were:

- The Dean's Council
- The University Faculty Senate Chair
- The President's Staff
- Director of Campus Security
- Affirmative Action Officer
- Dean of Student Affairs
- Business Manager's Council
- Associate Dean's Forum
- Student Representatives to the Board and the Faculty Senate
- Software Technicians

The groups and individuals participated in the review at different points in the process, some participating more than once.

THE POLICY: WHAT IS IT?

The Carnegie Mellon University "Data and Computer Security" policy is a Board-approved document that was developed by the Computer Security Task Force. The policy development took place over 10 months between November, 1989 and September, 1990.

The security policy applies to administrative data on central and distributed computers and currently does not apply to academic or research data. Only employees of the university are permitted access to this data. Access by non-employees is possible only if special permission is granted and a need-to-know is established.

The justifications for the policy are based on the importance of data as a "valued resource over which the university has both right and obligations to manage, secure, protect and control." The need to protect this data and the importance of defining the responsibilities of those who handle the data have prompted the development of this policy document.

The policy itself is divided into two parts, the first addressing security administration and the second outlining security procedures. The following sections briefly describe the contents of the document.

Security Administration

Many units within the university are essential to the development and enforcement of a comprehensive security policy. At Carnegie Mellon, these groups include the Administrative Systems department, the Computing & Communications group, administrators, executives and staff.

As mentioned previously, the Computer Security Task Force is comprised of members of all of these groups, appointed by the President and responsible for the maintenance of a secure administrative data processing environment. The task force formulates overall policy, addresses issues that effect computer security, reviews situations involving violations of policy and provides guidance for implementation and interpretation of policy.

The Administrative Systems department is responsible for the design, programming and maintenance of administrative applications, while Computing & Communications maintains and operates most of the computing equipment on which most of these applications reside. Both groups are responsible for proper security controls.

Fundamental to the policy and the administration of it are three new responsibilities at Carnegie Mellon: the "Data Owner," the "Data Security Officer" and the "University Data Security" officer. The Data Owner is the employee of the university who is responsible for the data in the system. In most cases, this is a division or department head. The responsibilities of the Data Owner include evaluation and approving requests for access to specific data or groups of data and ensuring the accuracy and quality of data residing in application systems.

The Data Security Officer (DSO) is the employee responsible for evaluation and monitoring systems access. He or she will evaluate requests for access to application systems and decide whether to authorize or deny the request. In addition, the DSO is in charge of establishing and deleting computer user-ids, resolving security issues and periodically reviewing the access privileges that have been granted to users. The Data Security Officer typically reports to a Vice President or other Executive level person. The University DSO works with the individual DSOs to provide over-all coordination, and serves as a focal point for university-wide enforcement of the security policy.

Although in practice, these tasks have been performed informally by users and technologists for many years, the policy officially recognizes these functions and clearly spells out, by application, who "owns" the data. The committee determined that it was important to the successful implementation of the policy that the data owner and DSO's responsibilities be explicitly defined.

The development of the concept of the DSO took many months to finalize. Members of the committee were concerned about the number of DSOs that would be needed, if there should be a University DSO and how much additional work would be required. Because administrative computing applications divide into three major functional areas, Enrollment Systems, Business Systems and Alumni/Development Systems, one DSO for each of these application areas evolved. Each DSO will work with many data owners in his or her division. For example, the DSO for enrollment systems applications will work with data owners in her division: the registrar (for student records), the director of admissions (for admissions data) and the director of financial aid (for financial aid data).

The actual responsibilities of the Data Security Officer and how those responsibilities related to those of the data owner were discussed at length during policy development. The model as presented here reflected what was currently being done in some areas, and set very clear paths for granting and monitoring access to data.

In addition to looking at who owned the data and who was responsible for determining how it could be used, it was necessary to examine the data themselves. The committee looked at the kinds of data that were stored in administrative databases and how these data were used. As a result of the examination, all university data were divided into four categories: public information, campus-wide information, restricted information -- moderately sensitive, restricted information -- highly sensitive. Classifying data based on their "accessibility status" made the tasks of identifying data security officers more reasonable. Table 1 delineates the data classes and accessibility guidelines.

TABLE 1. Accessibility of Data by Type

Data Type	Public Information	Campus-Wide Information	Restricted, Moderately Sensitive	Restricted, Highly Sensitive
Employee Data	Government forms requiring salary data; (IRS Form 990)	University Information	Appointment Information Non-salary related benefits enrollment information Biographical Information Employee Information Salary surveys	EEO Information by employee Salary Information by employee Termination / Disability Information by employee
University Finances	Annual Reports	Internal Annual Reports Quarterly Reports	Financial data by operating unit	None
Facilities	None	Building Use Information (Fact Book) Building Floor Plans	Building Maintenance Information	None
Students	*Directory* Information as identified in the university policy on "Privacy Rights of Students"	None	Biographical Information Academic Information	Financial Aid Information Parent's Financial Information Student Accounts Receivable Information Students Payment Information Career Service Information

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Alumni and Friends	None	None	Biographical Information	Gift and Pledge Information Financial Information Employment Information Biographical Information for Friends
Education and Instruction	Programs Offered Degrees Offered Courses Scheduled	Faculty Course Evaluation Results	Instructor Information	None
Research Activities	None	None	Proposal Information	None

Procedures

Specific procedures were defined to address the daily administrative computing business as it relates to the new security policy. Defined in the document are mir.imum security measures that are required for the operating systems, database management systems and networks used by administrative applications. The applications themselves must be examined on a case-by-case basis, so that security requirements can be determined. The often complex interaction with other applications, the operating system, the underlying databases, and the needs of the user community preclude an overall policy for application-level security.

Backup and recovery procedures explicitly require that administrative backup data be stored off-site, and that an approved disaster recovery plan be written and implemented to cover situations in which hardware and/or software cannot run in its normal environment. The DSO is charged with periodically reviewing the procedures that affect his or her area.

Passwords and the management of them is specifically addressed by the policy. Guidelines for password selection will be distributed to all users, specifically noting that sharing of passwords violated the policy. A password monitoring program was written as a result of building this policy, and is run on a regular basis. Users with insecure, easily guessed passwords are notified and required to change their current password.

Procedures to be used in managing systems for employee turnover have also been described in the policy. Automatic notification will be sent to appropriate account managers in the event of an employee's termination. Access to accounts will automatically be suspended, pending final authorization for deletion. This action serves to protect the employee in the event of any problems as well as to protect the university against any possible systems tampering.

Specific procedures that explain how a given employee can gain access to administrative data are spelled out in the policy. These procedures involve completing an application form and securing the approval of the Data Owner. In the event the Data Owner denies access, the decision can be appealed to the Administrative Computing Security Committee, which has the final decision in these cases.

Finally, the policy deals with maintaining confidentially of data, reporting security breaches and enforcing penalties. Administrative information generated by the university's administrative systems must be in compliance with regulatory requirements, (such as the Buckley Amendment) or university policy, (such as salary data are not public information). The Data Owner is responsible for determining what data can be released, to whom and the method and time of of its release.

In the course of performing job duties, many employees have access to restricted information. Their responsibilities to maintain the confidentiality of these data are clearly listed. Unauthorized release of restricted information can result in disciplinary action and possibly dismissal. Review of such cases is the responsibility of the Administrative Computing Security Committee, which will recommend the appropriate action. Referral will be made to the Provost, the Director of Human Resources or the Dean of Student Affairs, where appropriate. Matters involving individuals not affiliated with the university will be reviewed by the university attorney.

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THE POLICY: WHAT HAPPENS TO IT?

Once the policy had been written and agreed to by the committee, the next step was to obtain university approval. The policy document went through a series of revisions, based on comments that were solicited from various campus groups. The document was distributed to the Business Managers Council, the Enrollment Management group and the President's Council for comments during various stages of its development. Final approval was given by the Executive Steering Committee before it was present to the audit committee of the board of trustees. The formal policy was issued in June of 1990.

Implementation Plan

Writing a security policy is only the first step -- implementing it is perhaps the more difficult and challenging part of the task. Upon approval of the policy document, a subcommittee of the Security Task Force began the process of putting together a plan that would put the policy into practice. The objectives of this plan are:

1. the identification of responsibilities, actions and resources necessary to insure proper implementation of the policy

2. the assignment of specific responsibilities outlined in the policy to specific individuals

3. the development and implementation of campus-wide training and communications initiatives regarding issues of data and computer security

Detailed tasks lists were produced for the Data Security Officer, and the tools that he will need to perform each task were defined. In order to establish new user-ids and to monitor user behavior, the DSO requires a series of status reports for users and system resources and on-line access to some system utilities. Standard reports that are necessary to the DSO's functions include lists of valid users for a given application, lists of permits for each user, report of terminated employees, 'insecure' passwords, log-in attempts that failed and lists of user-ids with passwords that have not been changed in 90 days. These must be put into production and distributed to DSOs on a regular basis.

The DSO also must work closely with the technologists, particularly those in Administrative Systems who set up access privileges, to ensure that the application systems that are released meet the proper security requirements. Although much of this had been accomplished informally in the past, the approval of the policy clearly defines the official responsibilities and roles of individuals within the university with regards to enforcing a security policy.

A list of individuals to be designated as Data Security Officers was compiled and presented to the Executive Steering Committee for approval. By December 31, 1990 the necessary tools (reports and procedures) needed by the DSOs are scheduled to be in place. The implementation plan including campus communication and training, will begin in December, 1990 as well. A wide variety of media are scheduled to be used to publicize the policy, including organizational announcements, newsletters and electronic bulletin boards. A document summarizing the policy has been mailed to all current users of administrative systems and data. Training for campus users will be conducted on a regular basis. Initial plans call for members of the task force to train key departmental contacts who, in turn, will train departmental users.

Epilogue

Just so we don't get to blinded by the light cast from (development of) the security policy, it must be remembered that the real issues of concern to both technologist and non-technologist are security of information and computer-based resources. The security policy is simply the vehicle to communicate the concern about and interest in information resources to the institution, firm, agency or other organizational entity. The advocated theme of this paper is that the policy communicates the concern, consolidates potentially disparate procedures and provides authorization to enforce security. In the instance of Carnegie Mellon University the security policy is authorized at the highest organizational levels. The Board of Trustees responding to its own fears and the admonishment of the University's external offices directed the President's office to create the policy.

Given the policy, we now must turn our attention to the multiple threats. As stated in the Background section of this paper, concerns emanate from legal issues, from privacy concerns and even national defense. Commerce and industry have responded to multiple threats; so, too, has higher education. The obvious and rapid evolution of computer and communications technologies has placed society into an ever-changing scenario of security measures, countermeasures and counter-countermeasures implementation.

In the late 1960s, the main "security" concern was for the physical security of "the computer". This was, at least, partly due to the enormous capital cast of the then, mainframe hardware. Data security was not the key issue in the sixties. But with the advent of data communications lines into and out of the computer room in the seventies, the threat to corporate and personal data became a key concern. The eighties were the decade of the microcomputer and the needs of the "end-user".

And what about the nineties and beyond? The information society is upon us; computers are in the hands of all organizational personnel. Computers guide the flow of information and the business flow of the firm. So we cannot pat ourselves on the back because we developed a policy. The policy is a good start but only a start. So what is next?

The security policy must continue to have the full force of College and University authority behind it. The implementation of the policy calls for an increased awareness on the parts of many campus constituents, some of whom were not directly involved in the policy development. Who are these constituents? Students, faculty, administrative staff, database administrators, the newly-defined "data owners" and "data security officers," systems programmers, campus security officers, human resource trainees, University Ombudsman, legal staff and many more will need to learn, understand and live with the new security environment.

In addition to education, public information (e.g. the public announcement to the entire campus as shown in Appendix A), and specific training, all persons who handle data will be expected to be accountable for their day-to-day activities in the handling of data.

To supplement the policy, the University is developing a contingency plan for dealing with the many potential threats passed to both central and distributed computing environments on campus. The policy in intended to deal primarily with threats imposed by humans through raising levels of consciousness about the simple accidents as well as potential errors of omission and commission perpetrated by employees and others.

The policy also seeks to guard against unrestricted access and provide authorization for better controls, procedures and management over the domain of institutional data and information. The contingency plan seeks to provide for continuation of business in the event of either a physical disaster or an electronic invasion. Hackers can be a electronic problem, viruses and worms are a problem that exist either through electronic communications or magnetic media or both. The contingency plan also seeks to guard against the stoppage of business due to obvious threats of fire, water, power outage, explosives, glycol leaks and the like. Off-site storage of valuable institutional data is already in place; we could ill-afford to lose the institutions data resource because we kept it in close proximity to the "computer room". Many firms provide excellent, safe storage condition just to protect against loss due to having all the "eggs in one basket".

Security requires a policy but the policy is not a guarantee of security. Information security is a great management challenge and is a little like insurance; it costs money, may even be expensive and it doesn't help you much until you need it.

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APPENDIX A

PUBLIC ANNOUNCEMENT TO THE UNIVERSITY COMMUNITY

University Policy Statement

Access to data residing in administrative systems and applications at Carnegie Mellon University is to be granted only to those individuals who must, in the course of exercising their responsibilities, use the specific information. Access to administrative data will be granted to university employes only. Individuals outside the university can be authorized access to university data only if that authorization is granted by an Executive Officer of the university. Access and update capabilities/restrictions will apply to all administrative data, data stored on the Administrative Systems computers and on mini-computer and micro-computers across campus. Security measures apply to administrative systems developed and/or maintained by university departments or outside vendors, and **not** to academic/research computing.

Requesting Authorization for Administrative Data Update or Inquiry Capabilities

1. Fill out requests for access, indicating specific categories of information needed.
2. Have your supervisor approve the request.
3. Send the form to the Data Security Officer for approval.
4. The Data Security Officer will issue you a user id and password, in addition to provide specific information related to the application.
5. If you are denied the capabilities requested, you can appeal that decision to the Administrative Computing Security Committee.

Your Responsibilities as a User of Administrative Data

Use of Your User ID and Password
You are responsible to maintain the security of your user id and password, which permits you access to administrative data. You should use passwords which would not be easily assessed by an unauthorized user. Under no circumstance should you allow another individual to access data under you user id and password. Remember--you are responsible for any activity taking place under your user id and password.

Use of Administrative Computing Resources and Data
Access to administrative data is granted only to those individuals who need to use the specific information in the course of their responsibilities. Computing is a resource, and as such, should be used wisely. As a result, please practice good computing habits by logging in only when needed, trying to consolidate various tasks on the system, etc. This will help to improve the performance of the computing systems for all users, Also, data is to be used for job-related purposes only. Please use discretion in the handling of data.

Maintaining Confidentiality of Restricted Data
In the course of accessing data or information, you might access restricted information within the particular database. The following guidelines apply:

- When accessing restricted information, you are responsible to maintain its confidentiality. The granting of a user id and password assumes that you will maintain confidentiality over appropriate information without exception.
- The release of restricted data without the express approval of university management or outside the guidelines established for such data will not be tolerated.
- Unauthorized release of restricted information will result in appropriate disciplinary action, including possible dismissal.
- If you are aware of possible breaches in administrative data/computer security, you are expected to report such occurrences to the Administrative Computing Security Committee.

University Contacts

Contact	Telephone	E-Mail Address
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Disaster Recovery Planning at the University of Rochester: A Case Study

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Abstract: The University of Rochester had recognized the importance of disaster recovery planning for a long time, but it was not until it became involved in a smaller project, developing a contingency plan for payroll, that serious work on disaster recovery planning began. This case study reviews the history of the situation and draws some conclusions about effective disaster planning.

Disaster Recovery Planning at the University of Rochester: A Case Study

For a long time the University of Rochester recognized that disaster recovery planning was something that it ought to take seriously. It arose at steering committee meetings where the typical comment was "we really ought to consider. . . ." It arose year by year in the reports of the University's auditors. It arose among our computing managers and resulted in sending someone to a three-day conference on disaster recovery planning on an island in Florida. Some of the administrative offices, the registrar in particular, developed contingency plans for use in case the computers were unavailable just before graduation. (The University of Rochester, you see, has a long tradition of actually handing diplomas to graduating students during the ceremony, and that's not a good time to be guessing whether or not someone finished all the requirements.) There was no question that the University recognized disaster recovery planning as a "good thing."

But, all the while we recognized the wisdom in preparing a disaster recovery plan, we also recognized some very apparent drawbacks and difficulties. First, disaster recovery plans cost a pile of money. The little bit of investigation that we had done revealed to us both the expense of preparing the plan and the high cost of such backup facilities as hot sites and cold sites. Second, The preparation of a disaster recovery plan seemed sure to interfere with the daily operations of our staff, not just the computing staff, but the student records staff, the personnel staff, the finance staff, and everyone seemed always stretched too thin to take on another major project. Third, in the back of the minds of senior administrators was the concern, I suspect, that this would be another time when Information Services would ask for more staff. How would you justify that request against the requests and demands of other departments? But finally, the most telling argument was probably the feeling that disasters really happened elsewhere and that a large number of resources were required for the preparation of a disaster recovery plan to protect against something that was probably not going to happen.

The result of these conflicting perceptions of disaster recovery planning——that it was both beneficial and expensive— was an attempt to do it for free. Well, not exactly for free, but with information services picking up most of the tab out of funds already allocated. After all, the argument ran, planning for computer disasters is the responsibility of the information services group. Under the leadership of the Director of Administrative Information Services, the University engaged a consultant to help us with the planning.

The value we received from this was, in my opinion, mixed. On the one hand we received a good survey of risks that we could control, actions that would lower the probability of disaster. The survey pointed out fire and water hazards, demonstrated that the access control to the computer room was not as tight as it should have been and that there was room for improvement in tape handling and storage procedures. The results of the survey were taken quite seriously by the computing staff and numerous physical and procedural changes were made.

On the other hand, we received a two inch thick notebook that looked like a disaster recovery manual on the outside, but which probably would have been of little help in a disaster. The notebook included a generic outline of a plan, but not enough detail to guide our actions. It included forms for listing vendors, but I don't think that either the list of vendors or the lists of equipment that would be needed in case of a disaster were completed. It specified that the highest priority systems would be restored first, but when departments had been interviewed in an attempt to obtain priorities for recovery, the results were lists of the week by week activities of each department with no differentiation as to importance. Now clearly not all of these lapses are the fault of the consultant, maybe none of them are; we could have been more assiduous in carrying through. But the most dangerous thing about this disaster recovery plan was not that it was generic, or that the procedures were only partially documented. The most dangerous thing was that for several years some of the top managers of the University lived under the impression that not only did we have a disaster recovery plan which protected us, but that we had achieved it for practically no cost either in dollars or in staff time.

The estimated recovery time of this recovery plan was six months for administrative computing at the University. That's a long time for employees to put off the landlord or do without groceries. It's a long time to interrupt the development fund drive. It's a long time to compute grade point averages for 4000 undergraduates by hand, and it's a very long time to run a hospital without a full complement of employees.

To their credit, some of the information systems directors decided to seek a way that would allow them to run critical programs, especially payroll, during a disaster. Still looking for an inexpensive way to do this, they attempted to write an agreement with a nearby school that would, in the event of a disaster, allow either school to use the other's computing facilities for critical jobs. The idea sounds great, and both schools worked hard on it, but eventually it came to naught. The problems centered about issues of cost and control. One problem centered about keeping the two systems congruent. It appeared to be an

expensive proposition to upgrade a system because your partner did. It looked like a very time-consuming business to meet weekly with your partners across the city in order to keep up-to-date on system corrections and changes. And the people in charge began to worry about how such an agreement might affect the decisions we would inevitably have to make about major system changes. A second problem that lurked in the background at first, and then more and more in the foreground, focussed on the question of available time. With ever tightening budgets we found ourselves using increasing amounts of the machine capacity for standard work. There was less and less open time. Should our partner have a disaster and need to use our facilities, we might very well have to interrupt our processing to accommodate theirs. How long could either school be expected to keep this up before the attempt to deal with a disaster on one campus resulted in at least a mini-disaster at the other? The questions were serious questions and hard questions, and most of them never were answered satisfactorily. Although discussions lasted for several years, we never really reached a formal disaster recovery agreement.

It was at this point that we changed our direction. Instead of trying to build a disaster recovery plan which would allow us to reproduce our normal operating schedule in the case of a disaster, we decided to begin building a set of contingency plans that would allow us to continue departmental operations. The difference between the two is important. Our focus in disaster recovery planning had been to find a way to restore the normal operating procedures of the University. Although the changes in locations would be obvious to the technical staff, I think that in the back of our heads we had a vision of the rest of the University continuing along as usual. That picture changed. For the next few months, we decided, we would focus on the critical functions of the University that would be disrupted by a disaster in computing, rather than on the computing itself. After all, it's more important to register students for classes than to register them using computers; it's more important to send offers of admission to prospective students than to send computer-generated letters; it's more important to pay employees than to have automatic deposit of paychecks. For the time-being, our focus changed away from machine problems to operational problems. It became localized, shorter term, of more immediate concern to departments, and we moved out of the role of being the experts to a role of being coordinators and supporters.

The effects of this changes were four-fold. First, we focused on a smaller, easier tasks and as a result increased the probability of success. Second, because the task was smaller and easier to define we were able to gain better control of the costs. Third, instead of trying to solve the big problems, for which I just

don't think we were ready, we gained a great deal of experience in one aspect of disaster recovery planning. We floundered a bit, we made some mistakes, but because of the size of the projects the mistakes were not so overwhelming that we were not easily able to go back and redo those parts of the project. And having learned the mistakes on a small scale, we are now recognizing them more easily on larger projects.
Finally, because of the function that we chose to focus on first, namely payroll, we were able to generate an interest that led to willing, sometimes even enthusiastic, participation.

Preparing the contingency plan was a several step process. In outline the steps were

1. Identify the critical function that had to be continued during a disaster, critical to the operation of he University, not critical to data processing.
2. Review the nature of the disasters that could affect the satisfactory performance of the function.
3. Decide on a plan to ensure the continuation of the function.
4. Test the plan.

We'll look at each of these steps individually.

Payroll involves a lot of details, from collecting time sheets to calculating any of more than a dozen deductions through printing checks and supplying banks with automatic deposit information for employees who choose that option. But the basic issue of all of these was finding a way to get the net pay into the employees' hands on time. That single act was recognized as critical on several counts. For one thing, of course, University employees and their families depend on that paycheck for necessities. For another, at the Strong Memorial Hospital which is the University or Rochester's research and teaching hospital, paying the staff is also a patient care issue. Without the ability to provide regular, assured paychecks to staff, our ability to provide an appropriate level of care also drops. In the Rochester area, there are, for instance, many more jobs for nurses than there are nurses, and many of the hospitals, Strong included, have a significant percentage of the staff working on a contract basis.

The worst disaster that could happen was in which the the computers became unavailable, and even the time sheets from which payroll is computed for hourly employees were destroyed. The paradigm for this is a fire in the computing center 36-48 hours before we process the payroll. The time reports are in ashes; the hardware is unusable; the rooms in which the computers were housed are cordoned off by the fire department; some of our staff members are

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hospitalized.

We considered several options to no avail. Outfitting an alternate computer room in the hospital was too expensive; running the payroll system with its large files, multiple options for deductions and complicated record keeping on the small academic computer that belonged to the Simon School of Management was unworkable, contracting with a third party to handle the University payroll involved too great a change from the way we were currently organized. It wasn't until someone suggested that we drive a truck up on the library steps and hand out hundred dollar bills that we found a satisfactory solution. Actually we found two quite different solutions, one for regular employees and another for student employees.

For the regular employees the issue was getting their pay to them. The other tasks usually associated with payroll were not as immediately critical—including computing social security deductions, calculating payments to retirement plans, benefits, IRS deductions. The automatic deposit was not critical. As important as some of those things were, we had more leeway there than we did with the delivery of the net pay.

Moreover, in the scenario that we envisioned, we could not calculate the exact amount that an hourly employee earned, at least not soon enough to do anything with it. The time sheets were gone, destroyed by water or fire and we would have to depend on departments to replace that data eventually. Meanwhile, the best that we could do was to pay the employee our best estimate of the amount due and that, so far as we could tell, was that amount paid in the prior pay period. When we realized that, the solution was clear. After each pay period we would produce a tape containing the employee's name, social security number, division, department, and net pay. A simple program would allow us to use the Simon School computer, the one that was too small for payroll processing as it is usually understood, to print payroll advances on accounts payable checks and along with them to print a check register.

Of course there were questions and objections. What about new employees? They wouldn't be on the prior payroll and wouldn't get advances. We decided that for them we would have to issue hand-written checks, but that was better than writing 8000 checks by hand. What about terminated employees? This procedure would produce checks for persons who should have received their last check the prior period. True, again. If a disaster occurred we would have to depend on the department administrators, the men and women who distribute the checks to the employees, to catch such problems. That meant that we had better

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write the letter which would accompany the checks in advance, so that we would not have to remember these details at the time of the disaster. There were other questions, and not all of them arose while we were laying out the plan, but a number of them did.

Unfortunately, the same procedure wasn't a solution for student payroll. For student employees, one period's pay is just not a good predictor of the next. For one thing, the population changes by about one third between any pay student payroll and the next. For another, even for the students who are the payroll for several consecutive periods, the amount that they earn frequently varies by 200%. We decided to approach the problem by expanding on the existing emergency loan program. Currently, students can borrow up to $100 in an emergency, through the Dean of Students' office. They have to pay it back with in two weeks. After a little statistical investigation, we decided that should we have a payroll disaster, we would use an analogous procedure, still overseen by the Dean of Students' office, to lend students up to $200. (That would cover about 95% of the employees on the students payroll—students who had earned significantly more could borrow more if with verification from their employer.) The student had to sign a note, the payment would be due when the payroll was processed and if it were not paid, it would be added to the student's term bill, an action which could eventually block registration or graduation.

This process is a "busy" one. Verifying that the student status, handling the paper-work, and distributing the payments (to be made in cash, remember that the system is down and we don't want to write all these checks by hand and then trace them through the accounting system) involves coordinating the registrar, the bursar, the dean of student's office, campus security, transportation, and facilities, but it does not involve information systems and it does not involve the staff of the payroll department, leaving them free to focus on the employee payroll and other high priority effects of the disaster.

The first test of the employee payroll plan was intended to check several things. First, did all of the steps work? We had, of course, tested the print programs and the productions steps before, but the first full test required people who were unfamiliar with the program and the environment to work on a computer other than the standard administrative machine and print, burst, and sign, deliver, and account for paychecks under emergency conditions. Second, the test provided information about how long it would take us to produce emergency paychecks under this contingency plan. That was information was important to us for we wanted to know the time how much time we would have to decide on strategy in case of a disaster which was not destructive. Suppose, for

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instance, that, as once happened, a bulldozer took put the power for the computer center. How long could we wait for the power to be restored before starting the contingency plan? The third set of questions centered around determining if the instructions were clear. Could our staff follow the directions? Where did they have to make decisions? Did they have the information that they needed? Throughout the test we had monitors assigned to serve as timekeepers, to make sure that the test was carried on under emergency conditions (you can't go back to your office for your notes, they were destroyed in the fire), and to follow up with the departments that were included in the test to see that all the telephone call were made and the notices sent.

The week following the test, we met to revise the procedures slightly and to compile a list of issues that arose in reflection on a "live" test that had not arisen around the planning table. We examined the statistics from two consecutive payrolls and discovered that under the emergency procedures, most of the employees would receive within $75 of their correct pay. We also summarized our findings to the president's executive council.

The test was about a year ago. Where have we come since then? Four significant things have happened. A few months after the test we almost had the opportunity to put it into action. A mainframe failure looked as if it would keep us from meeting the payroll deadline and for a few hours we thought that we would be printing "emergency checks." No one wanted to do it, but the staff that had taken part in the test knew that it was possible. Afterward it provided an opportunity for us to review with the senior management paying the kind of attention that they had not previously paid to questions of disaster recovery the issues involved. This also led to a few changes in our contingency plan, including the assignment of one person to serve as liaison between the senior staff and the persons on working on the recovery and contingency plans, for we had learned in our brush with disaster that everyone from a certain level on up was calling to learn the current situation, and, in doing so, interrupting the recovery work.

Nobody really liked the contingency plan. Nobody wanted to use it for the problems that would face us after we issued thousands of payroll advance checks seemed enormous. The clean up of the payroll system, of the accounts payable system, of the ledgers, the problems of dealing with employees who received estimated checks, and the confusions that could arise about the benefit plans appeared to be at least as difficult as the physical clean up of a destroyed computing center. Despite all of our planning, or more likely because of all of the planning, it suddenly hit us that recovering from a disaster was going to be difficult, unpleasant, and costly. That realization led to the second outcome of the

contingency planning. The payroll unit tried to build a microcomputer model of the payroll system that would calculate exact pay due based on hours worked. At first it looked promising, but over a couple of months problems arose that made it impractical. Instead we turned our focus to developing better procedures for cleaning up after the disaster.

The third effort related to the establishment of the payroll contingency plan was the development of a contingency plan for those departments in the hospital which did not have one. Larger than the establishment of a backup payroll system, this project was designed to document operating and recovery procedures for hospital administrative departments and to determine how long they could continue to run using those procedures. The length of time that departments could go without serious difficulties arising from a lack of computer support ranged from three days for admissions and the emergency department to more than a month for a few reporting functions. What was important about his effort, in addition to the plans developed, of course, was the active participation of a large number of persons from across a broad range of responsibilities.

We are now back where we were several years ago, putting together a disaster recovery plan for the University of Rochester. By that we mean a plan which will enable us to last through a long failure of computing at the University and that will describe for us the steps we need to take to restore computing power and the order in which we need to restore computing applications. I expect that we will be able to complete our task less expensively, with fewer hours devoted to it, and with more effective participation than we would have been able to a couple of years ago. To date, a half hour or so with each of the senior executives of the University has enabled us to pinpoint those functions which are most critical to the operation of the University. Some time with the lawyer has given us some answers about other exposures. It is still someone else's responsibility to decide at what level the University requires and can afford disaster protection, but that decision will be made with a good deal more insight into the possibilities than was available several years ago. Collecting the information took about a month and a half; it was primarily a part-time assignment for one administrator who met with a small "direction committee" for an hour biweekly. We expect a report listing exposures and options to be available by the end of the year. Even at this, we are currently looking only at mainframe computing and not at the many departmental systems.

What have we learned? (1) Disaster recovery planning is a big job and demands a good deal of expertise. Start with a small, but critical area to get a feel for it. (2) Planning for disaster recovery effectively means focusing your

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attention first on the functions that are crucial to the operation of the university and then, once you have determined those, on the exposures to those functions. (3) A good deal of the ability for effective damage control and continued operation in the event of a disaster comes not from a large scale plan, centrally organized and directed, but from smaller, local contingency plans that have been thought out be the people who do the work every day. Little things seems to make the biggest difference. At the University of Rochester some of the most important things to have available quickly turn out to be lists, easily downloadable on a regular schedule from the mainframe databases, but only if someone thinks about it ahead of time. (4) Planning pays off, not only in case of a disaster, but in keeping aware of the possibilities for current operations improvements.

A Case for Common User Identifiers (CUI's)

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Boston College has been building and adapting a systems architecture under the label of the User Information System -- an environment in which the individual user (students, faculty, and staff) has the ability to directly interact with university systems. One of the accepted principles of open access to information is the establishment of common user interfaces to facilitate easy access to a multitude of systems. It is equally important to establish common user identifiers CUI's, which are simply data elements that uniquely identify users. This may seem elementary but for many institutions the setting of standards for user identification is still very elusive or disjointed. As access broadens the lack of standards and directory services will further complicate matters.

The presentation will explain the approach that Boston College has taken to develop standards for common user identifiers (i.e. ID numbers, user names, personal identification numbers (PIN's), network node names, ID cards, bar code labels, magnetic stripe encoding, etc.) and the deployment of common log on procedures. The presentation will include demonstrations of how the use of unique user identifiers (ID numbers, PIN's, user names, etc.) are established and maintained in a central directory service, and how these identifiers are used to facilitate the integration of various applications and computing environments. Multimedia demonstrations will focus on the ability to attach a variety of devices and/or interfaces to existing applications while maintaining conformance to the defined common user identifiers (CUI's).

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Introduction

Integration has long been a hallmark of information systems at Boston College, and the challenge of the 90's is to extend these distinguishing characteristics to include open access and interoperability. Three years ago Project Glasnost was formally launched; Glasnost being the code word for 'openness' and open access to administrative systems. The guiding principle that has been used throughout the design of administrative systems at Boston College is that of the User Information System (UIS): all members of the community, including faculty, staff, students, prospective students, alumni, and outside agencies must be provided open access to administrative information. Everything we do is in support of the premise that open access is to the benefit of both the institution and the campus community.

Central to our systems architecture is what Bob Heterick from Virginia Tech calls a "single system image". As users become connected to large networks with a mix of vendors, software and communications protocols, there is a need for a single log-on sequence, a single-system access control scheme and transparency between applications. Users should be able to log on to the network and be authenticated just once, instead of logging into separate computers and applications with separate procedures. The key is the establishment of a name directory that will permit a single log-on capability for users. The User Information System is designed so that the user views a single system which can be customized to individual needs with the appropriate functionality, and one of the accepted principles of open access is the establishment of common user interfaces to facilitate easy access to a multitude of systems. It is equally important to establish common user identifiers CUI's, which are simply data elements that uniquely identify users.

As soon as an individual is identified through the transactional system as being associated with Boston College as an employee or student, the User Information System (UIS) automatically generates common user identification information. Usually the first action of a new student or employee is to obtain a University ID card, which contain the unique common user identifiers (CUI's) of name, facial image, ID number, bar-code label and an encoded magnetic stripe. This card serves as a passport that has universal usage across campus. (The investment in an information system should not be measured solely by the initial cost of the systems development effort, or by the usefulness of the system to service the primary user offices. The real payoffs come when the facilities in the system architecture are fully exploited or used by other applications within the User Information System. For example, many universities issue a single identification card to every student, faculty member and employee, while others issue different ID cards for different application systems. The benefits of a single ID card in terms of lower production costs and increased utility across many applications are obvious.) At the time that the ID card is produced, the UIS also automatically

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generates the unique common user identifiers (CUI's) of username, password, and Personal Identification Number (PIN) for each individual. This set of unique identifiers collectively form the common user identifiers (CUI's) that are utilized by all applications in the UIS. The following is a list of common user identifiers that are unique to each user and are utilized to control access to the system and to automatically associate individuals in a variety of ways:

ID Card
Person's name
Facial image
ID number
Magnetic stripe
Bar Code Label
User Name
Pin numbers
Passwords
Position (Job) number(s)
Building/room number
Telephone Number
Network node name
Vehicle tag number
others.....

Central Directory Service

Common user identification information, security profiles, and demographic data for .:' individuals associated with the institution are stored in a central directory which forms the basis for directory services functions. The campus telephone directory is extracted directly from the UIS just prior to publication, and this directory is also available on-line in all computing environments as one of the standard menu functions. Usernames are unique and each user has a primary mail address. If the user has mail addresses on multiple machines or servers, the user name is the same in all environments and is known to this central directory. For example, I'm GLEASON on all Boston College systems (mainframe and departmental) on which I have an account, but my primary mail address is on the departmental server.

The central directory can be viewed as a collection of business cards for everyone affiliated with the university, including students. Like the business card, each directory entry contains name, title, campus address, telephone number, electronic addresses (user name and node), FAX number, and all of the common user identifiers. By employing a central directory service, it is not only possible to interconnect electronic mail systems into a single system,

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it is also feasible to consider using a single identification to access all messages, whether they are voice, text, or facsimile.

Common User Identifiers (CUI's)

Common User Identifiers (CUI's) are stored in a central directory service that is dynamically maintained by data supplied from administrative production systems. For example, the human resources system at Boston College contains a position control function, and as individuals are hired, terminated, or change positions, the system automatically assigns position-specific attributes, such as office location, telephone number, job title, and so on to the individual. In addition, the system assigns the access control profile associated with the job. Individuals may hold multiple jobs, or may attend classes in addition to being employed. At the time that an individual becomes associated with the university, or changes status within the university, his or her information is entered as a normal transaction function into the system (human resources or student record systems) which automatically alters the individual access control profiles that are associated with the individual. The person's personnel and/or registration records determine the individual's group or class assignments.

At log-on execution, users are allowed to gain privileges in one of five ways: by groups or classes to which they belong (i.e., faculty, staff, and students); by responsibilities associated with specific jobs; by individual (for access to his or her own records); by data dependency; or by organizational structure. At that time, the system applies the rules and develops a set of user profiles. The access control facility will then map all of the appropriate profiles together so that a composite of the individual's privileges is recalculated at the start of each session. This user profile can be accessed by any of the unique common user identifiers.

The hierarchy of departments and positions is defined within the system, and individuals, by virtue of occupancy in a position, may have access to information that is available to individuals in positions lower in the structure. For example, access to budget information for a grant in the biology department should be provided to the principal investigator by virtue of his or her job responsibility. The dean of the college, who may be seven or eight levels up in the hierarchy, may not be directly responsible for the budget, but would have authority to access the budget information using a workstation or telephone voice response.

Individuals have access to their personal records on a one-for-one relationship. For example, a student has access to his or her student account, financial aid, grades, and other records; employees have access to their own personnel, payroll, and student records. Individuals also have access to records based upon the data resident in records in the production systems. For

example, a faculty member has access to records of individual students for advisement based upon the registrar's designation of the faculty member as the advisor in the student's record.

Personal Identification Numbers (PIN's)

The changing of passwords on a regular basis is one of the standard controls in most security systems. In an environment where users are constantly accessing a system, this procedure works well. But if there are many infrequent users, then there is a different set of issues. Infrequent users will often write the password on a piece of paper, or will be discouraged from using the system because either they can't remember the password or it has expired. With large numbers of users, this can cause a logistical and administrative nightmare.

It is interesting to note that banks do not require users of ATMs to change passwords on a regular basis, even though unlawful access could result in the theft of cash. It is likely that the banks have concluded that it is better not to require frequent changes if by not requesting them, customers will be discouraged from writing passwords on their bank cards or on pieces of paper in their wallets. The same logic is applicable when dealing with limited access to information by the entire university community. This is accomplished by providing a unique PIN to all owners of a campus ID card at the time that the card is issued. Because the PIN is unique, it also serves as another student, faculty or staff ID number. The PIN can be thought of as a "half a password" that provides the first level of access control, determining the menu of services available to the users. Passwords and associated restrictions are required for deeper-access privileges.

The concept of the PIN also differs from passwords in another significant way. Just as the student, faculty member, or staff member will use the same ID card to access many application systems, the individual will also always use the same PIN. The repetitive use of the PIN in many applications makes it easy to remember, and at the same time, serves better than other possible qualifiers, such as birthdate.

On most campuses, servicing of students in the library and public computing facilities, as well as normal access to computing networks, is nearly a seven-day/twenty-four hour proposition. Students should be able to utilize the services of the network not only for course work, but also to access administrative systems, similar to the way we now conduct our banking business. Since the lifestyles of students are not synchronized with the standard Monday-through-Friday, 9:00-to-5:00 office hours, at Boston College, they have the ability to conduct business with the administrative offices of the university beyond normal working hours. For example, students can retrieve grades, review their student account, register for courses, and print

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course schedules by gaining access to the central directory and access control system in the UIS.

All institutions are not likely to attain complete integration of all systems, but it is still important to develop a perception of a single system. The use of a common access control identifier, such as user name, is one important component; another is to provide consistency in naming systems. For example, all systems at Boston College are referred to as the U-Series, where "U" stands for user, which implies that all the sub-systems are integrated and user-focused. The voice response registration system is called U-Dial, the purchasing system is U-Buy, the ATM student information access system is U-View, the food service system is U-Dine, and the electronic mail system U-Mail, and so on.

Multiple Access Methods

The design User Information System permits access to information from multiple device types. In cases where the telephone is used to interact with the system, the application is designed to function the same on all platforms, with the telephone keypad being the lowest common denominator. This design is referred to as the RISK, or Reduced Instruction Set Keyboard, technique. An example of this type of application is student course registration drop/add. In this application, the user is restricted to numeric entries (i.e., social security, PIN, course numbers, and selection and response keys) and function codes (i.e., star and pound signs). The terminal operator in the registrar's office with a full-function keyboard uses the same limited keyboard functions and numeric entries, and the same is true for a student processing the transaction using an ATM-type device, which utilizes a keypad similar to a telephone.

The following are examples of the use of CUI's in providing students with access to a student information and registration application using multiple access methods. In all cases, the underlying data structures and applications remain unaltered, the front-end device and the presentation vary from application to application.

U-Dial — Student registration and course drop/add using a telephone and Voice Response Unit (VRU). Student ID number and PIN used as CUI's to log on.

U-View ATM — Student information retrieval and course drop/add using a device similar to an Automated Teller Machine (ATM). Student ID card, magnetic stripe and PIN used as CUI's to log on.

U-View 3270

Student information retrieval, registration and course drop/add using an IBM 3270 terminal. For example, students can select the U-View application from the main menu of public access terminals in the library catalog area. Student ID number and PIN are used as CUI's to log on.

U-View VT100

Student information retrieval, registration and course drop/add using any VT100 terminal. Students can access the application through the VAX Cluster. Student ID number and PIN are used as CUI's to log on.

U-View Macintosh

Student information retrieval, registration, and course drop/add using a graphical front-end on an Apple Macintosh. Students can access this application from any Macintosh in the public computing labs. Student ID number and PIN are used as CUI's to log on.

U-View Dial-in

Student information retrieval, registration, and course drop/add using a Macintosh front-end that contains built-in terminal emulator. Student ID number and PIN are used as CUI's to log on.

NOTE: Each of these methods will be demonstrated during the presentation using multimedia techniques, including color, animation, on screen video, audio annotation, and screen capture.

By permitting users to access the UIS from a multitude of devices, we are not only providing users with the ability to access information in the most convenient manner but we are also addressing the problem of bottlenecks that commonly occur if an application can only be accessed one way. For example, if the single method application is an on-line registration and drop/add system, there may still be long lines, or if the method is dial-in registration, then there may be problems with jammed telephone circuits.

Integrated Applications

The availability of a central directory service that is a repository for common user identifiers facilitates the ability to integrate application systems and various computing and communications environments. In conjunction with the directory, the UIS is designed to easily employ intelligent routers. These routers are composed of a set of tables maintained by custodial user

departments and allow a user to execute mail or forms-routing transactions without stipulating the receiving party or parties. The identity and the address of the recipient is determined by using CUI's to access the central directory service. The system uses a mechanism to provide the user with transaction-generated messaging by having intelligent agents which know "who should know what," and automatically triggering messages or reports based on activity. This feature alerts individuals on a timely basis, rather than requiring the user to execute queries. For example, this facility automatically generates an electronic mail message to a professor alerting him or her to a student's withdrawal from the professor's course. In traditional database environments, we have written systems that communicated on an application-to-application basis, i.e., one program sending data to another program. In electronic mail systems, the communication is usually peer-to-peer, i.e., an individual sending a message to another individual or group of individuals. In the integrated database/mail environment, applications talk to peers and peers to applications, using CUI's to determine the identity of the peers.

Individuals are also able to initiate mail by addressing the message to a group and utilizing automatic distribution capabilities. For example, a professor can address a class assignment to all students enrolled in a course, as long as the system determined that the professor issuing the memo is also the instructor. If authority is granted, the system uses the class list to determine the students and the corresponding directory entries to determine the appropriate mail addresses and routing schemes. The system accepts messages and forms from different computing sources, and a single routing scheme is utilized for distribution of all messages and forms to a single desktop mailbox. Users who do not have an electronic address or who do not read messages within a prescribed time limit receive a printed copy automatically through campus mail.

Despite the growth of networks and permeation of desktop devices, the telephone remains the ubiquitous communication device in the home and office. The convenience of the telephone permits documents to be transmitted using a FAX machine, and the telephone has gained acceptance at colleges as a means to register for courses from their homes. In many instances, voice and data are being serviced over the same medium, twisted-pair wiring, and telephone switches and computers are gaining a higher degree of integration. The UIS is currently being adapted to support integrated voice and data services through a common set of controls that will manage access to both network and information resources. Included in the plans are the integration of electronic and paper campus mail facilities with the voice mail system, so that users can be alerted to entries in their voice mail boxes from the electronic system, and vice-versa. When a user provides a PIN number to the telephone system for long distance access, it will be the same PIN number that is used when logging on to the data system, and

telephone access security and privileges will be managed by the same security routines and techniques. The UIS will also support the integration of databases and telephone services. For example, at help desks the data base record of a caller will automatically be displayed on the screen. Users will also be able to access administrative systems information through the use of a touch-tone phone. For example, a department manager will be able to check on the status of a budget by entering an authorized account number, and prospective students will be able to check on the status of their applications. The system may support both stored and synthesized voice applications, and the selection of the appropriate technique by the system integrator is based upon the audience. All systems will be designed with date and time stamp functions so that users can perform status checks using either voice response or workstation access.

Conclusion

At Boston College, we have developed an integrated systems architecture, which provides a platform on which to build all applications, and which enables campus-wide data sharing. The User Information System can be characterized as interactive, integrated and highly standardized. The application of standards includes screen formats, program structures, naming conventions, data definitions, access codes, and common user identifiers, resulting in a consistent user interface across all systems. Most importantly, the single systems architecture, the single directory, the single access control system, and the data requirements are all complete. In a sense, the hard work is all done, and as new technologies become available from vendors, we will simply attach the appropriate services to the system as component parts.

The establishment and maintenance of common user identifiers is a common sense approach to the setting of standards. The conformity to standards and a single architecture has provided some obvious technical benefits, but it has also furnished a base for providing a true end-user computing environment characterized by ease of access and intuitive interfaces.

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A WORKING MODEL FOR MANAGING DATA STANDARDS AND POLICIES IN AN INTEGRATED DATABASE ENVIRONMENT

ABSTRACT

Two years ago, Bentley College established a Data Standards and Policies Committee to develop, monitor and maintain clear policies and procedures for the collection, integrity, use and disposition of data maintained on the College's centralized administrative database. This group, the successor of several unsuccessful predecessors, has worked quite effectively since its inception. Our paper reports the background for the establishment of this Committee, its structure and operations, with examples of issues it has encountered and has resolved during the past two years. We hope it can serve as a model for other institutions in dealing with issues of data standards and policies in complex centralized database environments.

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A WORKING MODEL FOR MANAGING DATA STANDARDS AND POLICIES IN AN INTEGRATED DATABASE ENVIRONMENT

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The Need for Data Standards and Policies

Since 1983 over 300 users in 30 offices at Bentley College have shared data stored on a PRIME INFORMATION database using the administrative systems package AIMS. Additional offices, while not having direct access to the data, require indirect access to it to perform their functions. The AIMS system is maintained by the Administrative Systems (AS) Department with an applications programming staff of up to 16 programmers.

During the past seven years, the AIMS system has been modified beyond recognition and new functionality was added to accommodate several offices.

During this same time period, a number of offices abandoned the AIMS system because they considered its functionality inadequate. Some offices quietly left the AIMS system because the data that they required were in a form that was inappropriate for them.

A fair number of offices discovered ways to circumvent the AIMS system when it failed to satisfy their needs. For instance, some offices devised means to store information on the system when there was no previously designated location for the data.

Frequently, information on the AIMS system was maintained and used by one office, but was also required by other offices. It was not uncommon for data to be referred to, and thought of, as being "owned" by the office that entered and maintained the information. In some circumstances, the "owner" and the other users of a particular set of data negotiated an agreement for sharing the information. However, in many other cases, there were disagreements regarding the access and use of information "owned" by one office and required by others.

When the "owner" of a particular set of data was unwilling to share that information with other offices, AS would be asked to intervene by either convincing the "owner" that the request was reasonable, or by quietly arranging access to the information.

At times, user requests were made to AS that, if implemented as specified, would

seriously have compromised the integrity of the database. Consequently, the AS staff was obliged to reject these requests.

The AS department was perceived by many users as wielding total control of the administrative computer systems. These users presumed that the AS staff unilaterally determined which offices had access to the information stored on the system, how each office gained access to the data, and when the information would be accessible. Correspondingly, these users expected the AS department to protect their data from "undesirables".

AS was seen as the police officer, judge, and executioner; an unenviable position for any office to be in.

The Search for a Workable Solution

The basic problem encountered with the AIMS system was twofold: the people with sufficient knowledge did not have the authority to make decisions, and the people with authority did not have the knowledge to make the best decisions.

Starting in late 1983, when Bentley College was implementing the new AIMS system, two committees were created. In part, these committees were formed to resolve the problems and issues that arose from establishing an integrated database system. One committee, the Administrative Systems Planning Committee (ASPC), was comprised of directors of various administrative offices from across the campus. The second committee, the Information Services Steering and Planning Committee (ISSPC), consisted of the institution's Vice Presidents.

ASPC's mandate was to resolve controversial issues. However, the member's of the committee typically failed to agree amongst themselves. Most of the members did not have sufficient knowledge to make an educated decision, and were required to rely on their staff to understand the possible ramifications of their decisions. This process was time consuming, and an incredible bottleneck developed. In addition, internal college politics often consumed the committee as most issues evolved into turf battles. When the committee failed to reach an agreement, the issue in question was elevated to the VP's ISSPC committee.

The VP's, however, were even less equipped than the ASPC members to make educated decisions about data administration issues. Consequently, some of the issues presented to the ISSPC committee were tabled for months as the VP's acquainted themselves with the issue and the various interested parties lobbied for their preferred resolution.

This alternative was definitely not working.

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In late 1984, a new group, Data Administration (DA), was formed within the Administrative Systems Department to handle the day-to-day issues that arose from the operation of an integrated database. Unfortunately, the users of the system, as well as the administrative systems staff, were hesitant to embrace this new group. The function of the DA group was not clear; the group was to manage the data, but to what extent?

In Ken Brathwaite's book, Data Administration: Selected Topics of Data Control, many possible definitions of Data Administration are presented. One definition, borrowed from M. L. Gillenson, is a broad description of data management:

> "[It] includes data-related planning, liaison to systems analysts and programmers during the application development process, training all relevant personnel in data administration concepts and techniques, standards setting and monitoring, database and possibly even application design, documentation...usage authorization, arbitration of disputes over access authorization and database system performance, change impact assessment..."

With all of the above functions as possible activities for the new DA group, one can see why people might be concerned about the impact that DA could have on the user's accessibility and control of the system. Many feared that the new group would involve themselves in everything, and become another huge bottleneck.

The end-users were also concerned that, since the DA group was in the AS department, the DA staff would have biased views and agendas that were opposed to those of the end-users.

Issues regarding the use and misuse of data constantly were identified by the new DA group. Many of these issues were potentially damaging to the system. Unfortunately, while the DA group had the knowledge and system rights to correct the problems, the group lacked the authority to implement necessary modifications to the system. Like ASPC and ISSPC, Data Administration was not the proper group for the job.

Examples of the type of problems experienced on AIMS:

Example 1. Human Resources

Human Resources (HR) is responsible for capturing and maintaining personnel data. HR quit the AIMS system due to concerns over system security. However, certain personnel data, (e.g., campus address, current employee status, and emergency contacts), which had been maintained by HR were also used by a number of other

offices. When HR abandoned the AIMS system, they informed Administrative Systems that they would not pass new or changed information to other offices.

Maintaining employee addresses, locating employees in emergencies, generating mailing labels, verifying employment and countless other functions now all had to be routed through HR as data on the central system became unreliable. Management reports or analyses requiring HR data merged with other system data (e.g., faculty workload analysis) became impossible to do. Multiple, alternative and disparate personnel files began to be maintained by offices around campus, each for their own use. The advantages of a common database were lost, and people couldn't understand why AS couldn't just "fix" this.

Example 2: Duplicate Records

Since its installation in 1983, the AIMS system has had duplicate records. When Institutional Advancement (IA) was converting to their new system, they did not want any duplicate Alumni/Development records transferred to the new system. Therefore, the IA staff carefully reviewed the AIMS Alumni/Development population to identify any duplicates. When a duplicate was located, IA chose those records that had contributions posted to them. The duplicate record without contribution activity was designated as the "bad" record, and any pertinent data was merged into the "good" record. The "bad" record would then be deleted from the Alumni/Development portion of the database. This still left the "bad" ID on the main database with it's information potentially spread across scores of files.

To ensure they never saw the bad record again IA removed any information they could from the main database file for these records. In addition, they replaced the first line of the "bad" record's address with "Duplicate of number ##" (## referring to the good record in the database). IA was confident that none of the merged records were active Bentley students.

Some months later, the registrars in Bentley's three schools, were processing fall semester correspondence for their active students. Some of their mailing labels, however, were printed with a strange message in the first address line. Obviously, the registrars were up in arms, angered over the fact that "anyone" could erase information on their students from the database.

Over the next week, the DA group worked about 25 hours to restore backups and recover the lost data. In addition, the registrars had to manually identify which students had been affected. Demographic information from the "good" record could not simply be added back into the "bad record. It was usually the undergraduate record that had contribution activity, and it was very common for an undergraduate student's address to differ from their current graduate student address. Complicating

the situation was the fact that IA had erased a critical data field that the registrars needed to easily identify current students and had done so over a 4 month time period.

Here was another instance where procedures, policies and controls were needed, What was lacking was the entity with both the authority and the technical ability to put these in place, or with the political persuasive power to have these accepted by affected user groups.

The Solution

The latest, and so far most successful, attempt to form a committee with both the knowledge to determine the best solution to data issues and the authority to develop and implement strategies and policies to address the issues came two years ago.

A Data Standards and Policies Committee (DSPC) was formed under the direction of the Vice President of Information Services. To quote from the VP's announcement:

> "...With the use of large complex databases...have come some unavoidable problems. Many of these problems have to do with what data are collected, who has the responsibility for collection, maintenance and integrity of the data, who may access, and use the data in what ways? Often these issues can be resolved among users and data base administrators. However, occasionally instances occur when different interests of offices conflict, or the issues need a broader institutional perspective. At other times institutional policies may be involved...These types of data and policy issues are best handled by an independent entity which combines technical understanding with an overall institutional perspective to balance the benefits against the costs of alternative policy options."

Indicative of the controversial nature of the mission of the DSPC, this official announcement was not distributed to the Bentley community until almost one year after the committee was formed and began its work.

Structure for Decision Making

The initial charge to the Data Standards and Policies Committee was extremely broad. Most importantly, The DSPC was to make decisions on data issues with the goal of maximizing the benefit to the institution as a whole, but not necessarily the benefit to any one operational department.

Within this broad context, the specific charge of the DSPC committee was to:

1. Ensure the existence and use of consistent data standards for all administrative computer systems.

2. Establish policies for data capture, maintenance, ownership and access, in particular in those instances where these issues concern several operating areas or where conflicts of interests among parties need to be resolved by an independent decision making group.

3. Ensure the availability of a reliable, complete data base for operational as well as for management information, institutional research and planning functions.

4. Monitor and ensure the integrity of the various data files by conducting periodic data audits.

5. Develop policies for data retention, archiving, and purging.

6. Support the conversion of various systems through the review of table definitions and coding schemes to assure their consistency, usefulness and completeness from an institution-wide perspective.

The role of the Data Standards and Policies Committee sounded very similar to the "classic" role of Data Administration. Once again from Brathwaite's Data Administration: Selected topics of data control, we are given one concept of Data Administration which sounds remarkably like the charge of the Data Standards and Policies Committee:

> "[It] is the establishment and enforcement of policies and procedures for managing the [college's] data as an [institutional] resource. It involves the collection, storage, and dissemination of data as a globally administered and standardized resource."

Because of the overlap with similar responsibilities usually assumed by Data Administration, it was important to have a close relationship between this committee and DA. A key to this arrangement working smoothly was for the committee to avoid trying to do the job of data administration. Keeping this distinction, that is keeping the committee focused on policies and standards, and letting DA handle the implementation of these was crucial to avoiding either of these two groups trying to do too much, or trying to do each other's jobs.

The second key to the success of this group was its composition. The criteria for

selection were that the person be familiar with how data are used in their respective areas, that they be key operational people in their offices, i.e. they had to be people who would be listened to within their own areas. A more subtle but maybe the most important qualification was that they be the persons with the greatest personal investment in the availability of reliable data, or put more bluntly, those whose lives are made most miserable when any data problems occur. These criteria gave us a group (larger than we originally expected) of highly capable, knowledgeable and dedicated middle managers from various user departments. (See Figure 1.)

The selection of the Director of Institutional Research to chair the committee, was intended to insure at the outset that neither DA nor a particular user group in the College would be perceived as dominating or controlling this group. Our contacts with colleagues in similar institutional research positions at universities and colleges nationwide indicate that an increasing number of them are being called on to play similar roles in their institutions. The reasons for this include their position as sophisticated users, their familiarity with multiple parts of the system, their personal need for and interest in the existence of accurate and reliable data for analysis and management information, and their institution-wide view.

Formally, at Bentley College, this committee reports to the Vice President for Information Services. This is a logical pathway for bringing institution-wide issues and policies to the attention of the top executive level of the administration. One of the circumstances which has made our committee function successfully during the past two years has been the relatively hands-off role of the Vice President. While he has not been reluctant to express sometimes strong views on certain issues, to date none of the decisions of the committee have been reversed, even when they did not match the Vice President's personal preferences. This fact has strengthened the committee and if anything, the knowledge that their decisions will be taken seriously, has made the group more careful and deliberate in its decision making when dealing with controversial issues.

The Process of Decision Making

The procedures of the committee evolved during the past two years. The committee meets regularly and frequently. Weekly hour and a half meetings at a set time are the routine unless there are few or no agenda item ready for discussion, in which case the meeting is shortened or canceled. The norm is to meet weekly, but not to waste people's time unnecessarily. Minutes are kept and written up each week. Guests are invited from time to time as needed from various user offices or support areas (e.g. internal auditor, legal advisors).

The decision making process itself is often slower than some would wish. However,

MEMBERSHIP OF DATA STANDARDS AND POLICIES COMM

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Manager of Data Administration

BUSINESS AND FINANCE

Project Mngr for Bus. & Fin. Conversion

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Mgr. of Human Res

DATA

STANDARDS AND POLICIES

COMMITTEE

STUDENT AFFAIRS

Dean of Students
Dir. of Residence Life

INSTITUTIONAL

Director of Adva

ACADEMIC AFFAIRS
Registrar - Undergraduate College
Registrar - School of Cont. & Prof. Studies
Registrar - Graduate School
Dir. of Research for Enrollment Planning
Dir. of Graduate Admissions
Suprvsr. of Admin Serv. - SCPS
Research Analyst - Daen of Faculty's Off.
Project Mgr. for Academic Aff. Conversion

FIGURE 1.

this is because the issues rarely are as simple as they initially seem. Often procedures and operations of several offices are effected, and in some cases deep philosophical differences exist about how people view issues. We strive for a consensus, but are willing to make decisions by majority rule if a consensus is not possible. The possibility (threat?) of a majority decision sometimes can make compromising to reach consensus a more attractive alternative. Dealing as we are with technological issues, we often find that the technology can be modified to give us a solution option that most of us can live with and be comfortable with.

The time commitment for members of the committee can be a problem. As key people in their respective departments, the committee members are generally very busy people. Two things appear to be important in keeping people active and committed. One is that things get accomplished. Decisions, although sometimes lengthy are made, closure is brought from time to time, and real operational issues and problems are resolved. This is essential the making members feel that they are not wasting their time. The other important element is an atmosphere of camaraderie. We feel that we not only suffer together through endless meetings but we also have a level of understanding of each other's issues which often we do not find from anyone else in our own areas or departments. It's nice to be able to talk about data and systems is ues to others who can understand and appreciate our problems. Getting help makes us all more willing to give help, in spite of our already busy workloads.

Sampling of Issues Considered

The following are some examples of the various types of issues which the Data Standards and Policies Committee has encountered during the past two years and the way the committee resolved each.

Issue: Instances of invalid codes occur in database, as a consequence of unedited loading of data.

Resolution: DSPC asked the Data Administration staff to run audit programs and reports results to the Committee. The Committee reviewed and authorized changes and edits to be made (global or individual) after assuring that changes will not disturb any operational function on campus. Data administration then performed any necessary backups, executed the authorized changes, and repeated the audit after the changes were made.

Issue: Duplicate coding schemes for faculty ranks were found to be used in the system.

Resolution: Independent parts of system were found to use different coding schemes for faculty rank. Data administration was asked to perform audits of the data. DSPC agreed to and authorized a new uniform coding scheme. Administrative offices agreed to inform faculty and staff about the changes to the new coding scheme. Data administration performed backups, executed the recoding of the data in the database and repeated the audit after the changes were made.

Issue: New data code tables had to be set up in the course of the conversions as we migrate to a new software system.

Resolution: All new data code tables for new system are passed through DSPC for review and approval. Changes are often suggested and made. Any subsequent changes are also passed through DSPC. DSPC maintains log of all approved data code tables and their successive iterations.

Issue: An institutional policy decision was needed concerning the use of either social security number or generated numbers for student ID.

Resolution: The Data Standards and Policies Committee examined the effects of alternate schemes on the problem of duplicate records, reviewed the literature of arguments for and against use of Social Security numbers as ID. These arguments pro and con were discussed at some length, including a soul searching deliberation over issues of privacy. Technical capability of our systems were explored for alternative options. Finally, the decision was made to use generated ID's while maintaining Social Security numbers on system separately, and having all ID searches run against both fields. Thus minor technical changes to system procedures allowed us to come up with a policy which everyone could accept.

Issue: Institutional policies and procedures were lacking or confused concerning the use and release of student directory information for internal use, to student organizations, to faculty members, to the general public, and to outside vendors, agencies and organizations.

Resolution: Policies and procedures were discussed and developed by the Committee based on the varied experiences of the departments represented by committee members. The Committee then developed informational materials to advise the user community concerning these policies and procedures. New forms were designed to allow for audit trail for data release requests and for signoff by requestors acknowledging restrictions on the use of released materials.

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Issue: Institutional policies and procedures were needed to insure security and control of system data code validation tables and edit rights to these tables for various users.

Resolution: System data code tables were differentiated based on the needs of users for frequent additions or changes to code tables. Some tables, designated "closed", could not be changed by anyone without prior approval from DSPC, and then changes were to be made by data administration only, following standard procedures for backup and other checks. Some other tables, those requiring frequent changes and used primarily in only one functional area, were designated as "open". A limited number of users were granted rights to add codes to these "open" tables or change code description, with subsequent notification of DSPC. Removal or changes to the codes themselves in these tables must still have prior DSPC approval and pass through data administration's routine audit, backup and change procedures.

Data Administration's Reactions

It is no surprise that the DA group has been very pleased with the formation and success of the DSPC, a body with the power to decide controversial issues. The DA group supports the committee as researcher, analyst, implementor, and documenter, but not decision maker. Definitely, DA has had views regarding most of the issues that have come before the committee.

The establishment of the DSPC has given the DA group another chief. The committee decides how an issue should be resolved, and DA implements the resolution. Frequently, DA must collect background or baseline information for the committee as they review an issue, and when a decision has been made by the DSPC, the DA group must prepare and implement the database or system modification. Many times, the DA group requires more time to research an issue or implement a modification than is needed by the committee to resolve an issue. It is not uncommon for DA to delay the resolution process as it gathers information for the committee.

Committee Members' Reactions

The committee sometimes sees itself as taking too long to resolve issues, particularly those of a controversial nature. In its defense, the committee must revisit an issue many times before all of the necessary people have become involved, the information has been gathered, and all aspects of the issue have been analyzed.

In addition, the ramifications of some decisions by the DSPC are quite significant. There may be major, behind the scene changes that need to be completed to

implement a committee's decision. There often is a great deal of preparation work that must occur for a decision to be successfully implemented.

None of the committee members had any of their other responsibilities reduced when they joined the DSPC. Committee assignments must be squeezed into already tight schedules, making it difficult for the members to complete the work of the committee.

Conclusions and Future Directions

The Data Standards and Policies Committee at Bentley College has worked well during the past two years. One of the chief spinoff benefits from this committee is a heightened awareness and realization on the part of key users of the complexity and the interdependence of the system which they use. The members of the committee have matured from having a parochial view of the system to a much more global appreciation. In addition, the committee has provided a somewhat unexpected forum for discussion and airing of some very different and valid views concerning such issues as privacy rights, data ownership, the tradeoff between security and user flexibility, and the need to educate the broader user community concerning the use of data to which more and more of them now have broad access.

Future directions for the committee will include policies concerning archiving and purging of data (so far usually avoided by just upgrading hardware capacity and power), other security issues, as well as the routine work of assuring the integrity and accuracy of the exploding volume of data maintained on our systems.

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Adding Value: The Role of Documentation in Application Development

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Is documentation important? How does documentation fit into application development? This paper discusses the changing role of Documentation Services, part of Administrative Systems Development (ASD) at the Massachusetts Institute of Technology. Originally, Documentation Services supported the central development department (ASD) and the client base — always on call, always available. However, two years ago ASD adopted a structured application development methodology for projects and implemented a chargeback system for working with clients.

While clients still want their user and technical manuals, they are more careful about defining what they need and how they will use it. And Documentation Services must demonstrate that the perceived costs of producing manuals during the development cycle will actually save money later, when the application is in production and during maintenance.

This paper approaches the value-added role of documentation from three perspectives: the director of ASD who led the change in organizational focus, the manager who markets writing services and develops projects, and the editorial supervisor who enforces standards and makes sure the client gets what is needed.

Introduction

A key part of the development of any computer application is the documentation. Documentation can include various products: user manuals, programmer reference manuals, system manager procedures, training guides, on-line help. As more and more people in a university use on-line computer applications, and as those applications become more functional and complex, the need for thorough, effective documentation is being recognized more universally.

The Massachusetts Institute of Technology (MIT) is a large research university with a diversity of administrative computer applications. In its last fiscal year (July 1989 – June 1990), MIT spent $19 million on the development, maintenance, and operation of administrative computer applications. Over the last decade, MIT has gradually distributed the responsibility for the development, maintenance, and support of these applications from a central group to many of the business units who are the custodians of the applications. Today, application development is divided about evenly between departments who provide their own application support (through either their own staff programmers or outside consultants) and those who use the central group, Administrative Systems Development (ASD). Figure 1 below shows how the costs for administrative computing were distributed among the major administrative areas of the Institute.

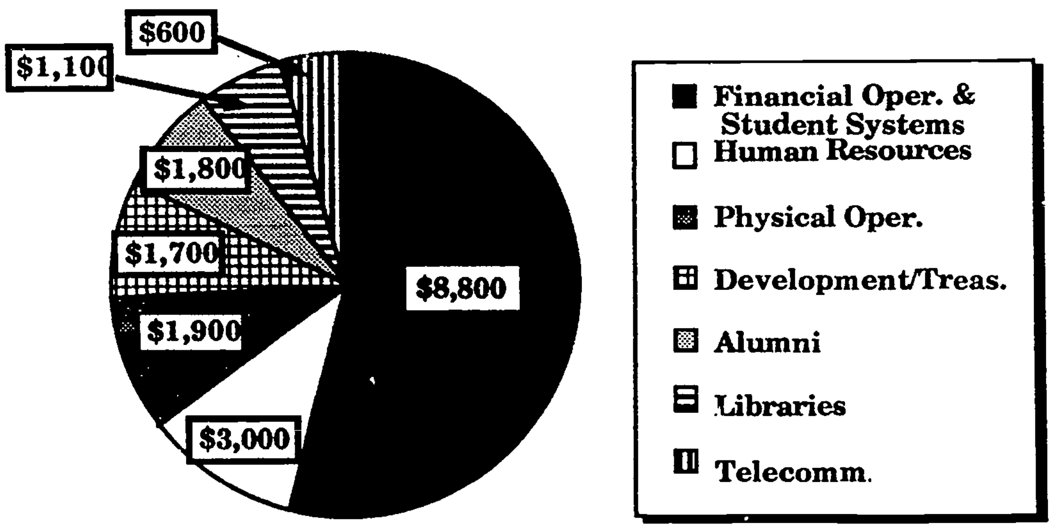

Figure 1. Administrative computing costs by area, fiscal year 1990.

In addition to having an environment of distributed responsibility for administrative systems, MIT also has a heterogeneous technical environment. Administrative, or business, computer systems run on IBM mainframe computers, Digital VAX computers, and Apple and IBM personal computers. Database management applications include ADABAS, Ingres, and Oracle. Many older applications use VSAM and RMS "flat files". For communications, the majority of administrative users rely on point-to-point communications from either dumb terminals or personal computers in terminal emulation mode. Some people take advantage, however, of MIT's TCP/IP campus spine network, which has many DECnet, Novell, and AppleTalk local area networks connected to it.

The Traditional Approach to Documentation

In the last few years, ASD has implemented both a chargeback mechanism for its services and a structured application construction methodology. These changes, when combined with the partial distribution of responsibility for application support, have affected how ASD provides services to its clients and the role of documentation in an application development project.

Prior to these changes, ASD's predecessor organization was responsible for the majority of administrative application development work at MIT. All of its work was funded centrally from Institute general and administrative funds, with no chargeback for services provided. Most clients were not heavily involved in the development of new applications. Often, they spent little time with analysts developing specifications, and, consequently, those applications did not meet their business needs. Partially because they did not pay for the services provided, many clients felt they did not have a strong stake in a new application's success.

For many years, the central application support group has included a team of full-time, professional technical writers (currently numbering six, plus a manager). In the past, clients had little input into the documentation process. Most of the manuals resulted from interactions between the writer and the application programmers. The level of contact and cooperation between the writer and the client usually mirrored that between the programmer or analyst and the client.

In this environment, the degree of success of a new application project was usually a factor of the individuals involved (on both the service provider and client sides), rather than as the systematic result of the processes, standards, and tools used. Results were mixed, with some projects succeeding and some failing. These mixed results provided much of the impetus toward implementing some of the changes described earlier.

Documentation in a Distributed Environment

In a distributed environment, application development is spread among our own development arena, using an application development methodology (Productivity Plus, licensed from the DMR Group Inc.) and development resources allocated to business units, which include outside applications development contractors, internal programming teams that may or may not adhere to a development methodology, and commercial packages (with or without vendor support and documentation).

Documentation takes on new roles under these varying conditions. It affects development in an ordered sense by requiring use of system specs and forcing their early refinement. It may be a vehicle to connect software bridges to packages. The writer works as a client advocate in the design of screens and usability testing for user documentation. ASD advocates that writers be included in the overall project plan and viewed as part of the development team, not adjunct to it. At MIT, the documentation team is frequently the only ASD team the client sees since he or she may be one of the business units using application development resources outside ASD.

Productivity Plus has brought home the importance of thinking before throwing those shrinking dollars into the first hole that looks attractive. It prescribes a route

for developing and documenting an application. In fact, deliverables like the preliminary analysis reports that detail the business requirements and proposed solutions become a "gateway" to obtaining project funding through the Administrative Computing Steering Committee at the Institute. The purpose is always to balance time and costs with the most functionality possible. In a time of careful money the question of the usefulness of documentation is raised often. In a chargeback organization the reasons for including it must be especially viable.

The methodology supports our notion that documentation adds substantial usability and ease of maintenance to an application. Seeing those values is easy if you live with the notion all the time. Explaining them to clients who are juggling development and operating resources is not so easy. Typically we hear that documentation is too expensive, there isn't enough time to do it, the client has the specs (well, we've SEEN those specs), and our all-time favorite, no one reads it. Given the complaints about documentation in magazine articles on software ratings, we suspect more than a few people sneak a glance at it now and again.

Instead of arguing about the issues, we try to get people to look at documentation with a "longer" view — as a snapshot or record, as an explicit interpretation of decisions about navigation, module relationships, functionality. Documentation is frequently used as a training vehicle and for developing testing protocols during maintenance programming. A full documentation set records the procedures and responsibilities of multiple constituencies — the users, the system manager, the programmers, in black and white.

Working with a Contractual Net

With this grounding, let's talk about structuring the documentation process to get real value. For one thing, we work with a couple of different kinds of contracts. Contracts do several things. They support the notion of individual accountability, and they legitimize an activity that often suffers from the skepticism of nonbelievers. The scheduling aspects prevent projects from becoming sinkholes.

Documentation Services' first layer is a Service Level Agreement or SLA. That's the level at which the project dollars and duration are worked out between offices, and people on both sides are committed to the project. The next level is a project plan which is largely constructed by the assigned writer with the assistance of the client contacts.

It is within this phase that the real hammering out of a documentation effort takes place. The writer takes any background information available — we hope a business requirements analysis or request for proposal, at least — and determines the level, scope, and preliminary content of a project. Meeting with the clients, he or she works out the objectives, content, schedules, testing, reviews, and production methods. This joint effort becomes the partnership that results in a better document. The project plan is the critical road map for a documentation project. Its schedule mirrors the development schedule, since the application development methodology rules state that we must deliver a system *with* its documentation. Signoff by all involved people is required before writing begins.

Project plans and Service Level Agreements are adjusted for the strange and wonderful things that can happen during the course of any project, particularly lengthy ones. Their iterations form part of the project record we describe below.

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At the end of a project cycle we do two things. We ask clients to sign task acceptances as a way of formally turning over the documentation and signalling the end of our development involvement. We also ask the writer responsible for the project to complete a project summary. These summaries are designed to record all the phases of a project, the problems or variances, the normal processes, the places where we tried something new or used a different metric, the status reports and communications vehicles across teams, etc. This record is critical to planning similar projects and looking for change and trends in the documentation process.

In a dollar-conscious culture, projects summaries and project accounting mechanisms provide benefits to the client and to ASD. Used with our other project records, we can track real project hours and bill for real activities; we also can look for where we (clients and ASD) may need to refine a phase or change the way we perform an activity. However, we have noticed that this continuous monitoring can contribute to the vestigial paranoia that "pre-accounting era" staff members bring to projects. The upside is that we have discovered that this tidying up has the effect of bringing closure to the projects, a real plus for people working on multiple projects. They are then free to ramp up to devote the same energy level to the next project going into critical phases.

The team approach with development, the partnership with clients, and the ability to assume virtually total control over a documentation project means that the writers must be mature professionals who are capable of planning, creating working relationships, and communicating with colleagues, clients, and managers. They know their capabilities and rely on their own team to help increase their application and documentation knowledge bases. Our staff does not have entry-level writers. The writing and basic design skills of our writers are solid. Their technical training is as current as we can make it.

The writer as part of the development team must be a client advocate — transferring what he or she knows about the client and the needs of the office to the development effort. Documentation people often know the users better than anyone else. A writer also must get development team buy-in to the documentation process which is sometimes perceived as a burden on the technical folks. We try to make that process as painless as possible. The real professionalism comes in the tangible pieces of human factors engineering — screen design and logical procedures. Writers also participate in the testing of an application. As client advocates they are able to look at the application with the client's eye early on.

As with the case in most changing environments, we spend a chunk of our time educating our clients to "do the right thing". Engendering trust and assuring the client that they will benefit from the process we propose is ongoing — even with people who have worked with us before. We must remain mindful of their concerns and yet focussed on what we know is the "right" way to provide documentation that will last that client through the long haul.

Working with Clients

Once the SLA has been signed and the project plan has been written and accepted, the focus shifts from management to the day-to-day operation of the documentation project. At this level, the ASD technical writer works with the programming or administrative staff in the client office. Several aspects of this relationship bear on the value-added nature of the documentation produced. These aspects are:

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- expectations that the client brings to the project
- expectations that the writer brings to the project
- client education
- project team participation
- advocacy
- quality assurance
- efficiency of operations

The first two aspects focus on the expectations at the beginning of the project, while the other five aspects concern how the writer works to deliver the manual that has been contracted for. We examine these in closer detail in this section.

- **Client expectations.** The client staff working on the project have expectations that have been passed on from the client manager or administrator who signed the SLA and project plan. Client staff expect that:
  - The writer will deliver what was contracted for. For example, if the project plan describes a 80–100 page manual for data entry operators, then at the end of the project this is what the writer will deliver.
  - Staff in the client office are involved throughout the life of the project. Their primary role is to provide information to the writer; other special roles (such as reviewer or documentation tester) are defined in the project plan. The writer doesn't disappear after the plan is signed and then magically reappear to deliver a finished manual three months later. A writer writes **about** an application or a system, but because the writer writes **for** people he or she must work **with** people.
  - The writer will communicate with the client staff during the project, since the project plan specifies wee ly meetings and monthly status reports. This communication ensures a manual based on the client office's needs.
- **Writer expectations.** The writer also has expectations about the project. Some of these expectations were formed during the writing of the project plan, while others come from experience with previous projects. The writer expects that:
  - The client will be responsive. Because the client's responsibilities are defined in the SLA and the project plan, the client manager is able to plan to make time, resources, and reviewers available — the client office has money invested in the project and will want to be part of the process to ensure that the final product is good.
  - He or she will know what the project goals are, since these are clearly defined before writing begins. For example, if the project plan describes a 40–50 page manual for a billing module, the writer won't be surprised part way through the project with a request to document an accounts payable module as part of the same manual.
- **Client education.** During a project, a writer works to educate staff members in the client office about the content and quality of their documentation. This educational activity is ongoing — it doesn't consist of a five-minute pep talk at the beginning of the project. Some areas covered are:

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- The writer periodically may have to justify full documentation for an application, keeping in mind both the immediate and the long-term readers of a manual. For example, a manager may say, "Keep the manual short, you can skip the stuff about logging on, my staff already know about that because I've trained them well." (Sometimes the manager thinks that a shorter manual will take less time and, therefore, less money.) In reply, the writer can acknowledge that, while the staff are well trained, a new staff member may need to substitute on short notice, or that sometimes even well-trained staff need to review procedures. The writer also might point out that the three or four pages of explanation will add little to the total writing time.
- The writer may have to explain having complete documentation as a backup in case of a "critical incident" — for example, the manager being hit by a bus while crossing the street at lunch, or the only data entry operator knowledgeable about the security system winning the lottery one day and quitting the next.
- The writer may need to remind a client to provide all the information needed for a particular procedure. For example, the writer may explain that it is important to provide a table of numerical codes for a two-character state field on a screen. If this information is omitted from the instructions, the data entry operator may use the zip code letters instead. While this error can be flagged for correction easily with an error message, it saves time and keystrokes to provide the information in the manual.
- The writer is responsible for managing the documentation project. If necessary, the writer will remind client staff about their responsibilities and the deadlines of the project.

Client education is an ongoing effort that affects all levels of interaction between the central application development group and clients. Figure 2 illustrates how this effort can be seen as a triangle.

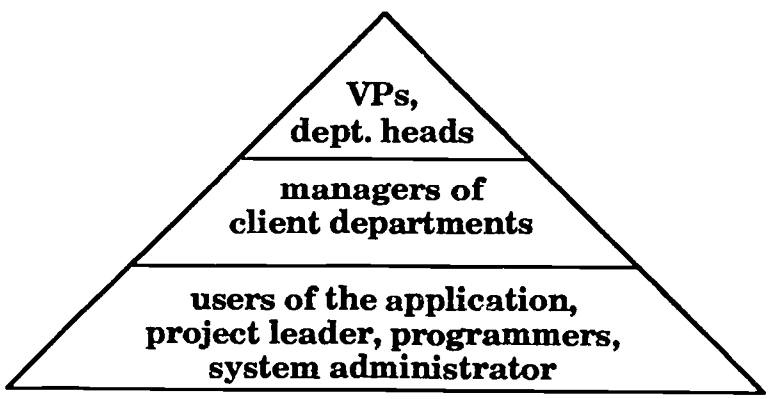

Figure 2. Levels of client education.

Client education occurs on a face-to-face basis, customized for each interaction.

- At the top level, involving a small number of people, the Director works with his peers, the vice presidents and department heads, to educate them about the importance of documentation in their long-term planning and budgeting for application development. This educational effort is general in nature and may not be focused on a specific project.

- At the middle level, the manager of the writer group works with managers in client departments to negotiate SLAs and project plans, and in the process educating them about the need for quality documentation.
- The writer on a specific project works at the bottom level of the triangle to educate the project leader, application users, programmers, and/or system administrator as the writing proceeds. While this effort may involve a larger number of people, it is also the most focused, since it may involve the importance of including a diagram or a table of field values or a short chapter on logging on. In this case, the writer works to demonstrate why the documentation is important to these day-to-day users of the application.

Client education is iterative at all levels of the triangle, in the same way that we must be always emphasizing quality information systems

- **Project team participation.** Having the writer integrated into the development team is a trend noted in both project management and technical writing journals. In addition, the application development methodology used at ASD mandates client involvement during project development. The writing staff has an important role in that interaction.
  - The writer understands the application better if he or she is involved from the beginning. This understanding makes writing the manual easier and quicker, since the writer has a larger context to explain the application to the reader and does not need to learn the application before writing about it.
  - The writer brings another viewpoint to the day-to-day programming effort. Frequently the writer may spot gaps or weaknesses in an application. For example, while testing a data entry screen for an investment management system, a writer may notice that the system accepts 1992 in a field for the current year. Since this field is used to compile the value of investments owned in a certain year, the mistake can lead to an error in the dollar totals. The programmer may not have realized that a program check is needed to guard against typing errors such as "1992" for "1991".

As this example points out, the writer is in a fragile place here, with a foot in both camps — the development team and the client office. This highlights another aspect of the writer's role — being an advocate for the system user.

- **User advocacy.** Even though the writer is contracted to produce documentation, the writer's ultimate responsibility is to the system user. The writer can ensure that both the documentation and the application interface (screens, reports) meet the users' needs. As an "outsider" (non-programmer) on the development team, the writer can advocate for a better developed system. Three examples can demonstrate this position.
  - A programmer, with an "insider's viewpoint", may use the mnemonic command "P" for "purge", a command frequently used with mainframe computer systems. However, in a Macintosh-based application, "P" almost always means "print ". With an "outsider's viewpoint" (that of the user), the writer can spot this problem and can explain to the programmer how the user expects a consistent use of commands across a system. (The programmer may already know this, and merely needs another pair of eyes to spot the mistake.)

- The writer understands how a user may approach a system. People who use several applications during the course of a day may enter dates in different ways for each application; non-English speaking staff may not know what date format to use. The writer can insist on having on-screen instructions or on-line help for date fields to demonstrate or explain the correct format.
- The writer can reword an error message such as "code 914 error; fatal" into something less drastic and more helpful, thus helping the reader to more quickly understand and correct an error.

- **Quality assurance.** Three aspects of quality assurance are important here.
  - The writer ensures that the manual meets the quality assurance standards used by the writing group. These standards help to prevent omissions in the manual's structure as well as to ensure internal consistency.
  - The manual also has a complete grammar and format edit.
  - In addition, the manual must meet the project goals as defined in the SLA and project plan at the beginning of the project.

- **Operating an efficient writing group.** The final aspect of working with the client focuses on the internal management of the documentation group. An efficient writing group can be achieved by several of the following techniques.
  - Using word processing and layout software efficiently frees writers to devote more time to writing.
  - Developing templates provides for quick development of documents and results in a consistent format and structure for work produced by the group ("corporate look"). For example, a writer can produce a title page with the group's logo and complicated format in only a minute or two by filling in the blanks on a template.
  - Writers share their experience on projects and solutions with each other. For example, once a writer develops a graphic showing the keyboard of a popular microcomputer, the illustration can be used in several manuals.
  - Senior writers and an editor guide large projects and help troubleshoot problem writing areas. Thus, a writer in the documentation group does not work alone or unsupported, even most of the working time is spent with the project team staff.

Summary: Benefits of Good Documentation

The payoffs of quality documentation — the value added aspect of application development — are explained in the list below.

- **Professional feeling.** If the manual communicates by its look and writing that an application is easy and direct to use, the users will feel reassured about using a new application. A quality product with quality documentation communications to users that they are an important part of the organization. Staff may experience less frustration using an application and may actually work more efficiently; they also will feel better about their jobs.

- **Better applications.** Better in two ways: **for the user,** since the writer is a client advocate bringing human factors training and experience to the development

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team, and **for the institution**, since studies show that well-documented applications need less staff for training and support after implementation.

- **Knowledgeable staff who can use the system better.** Full documentation for a system can be used for training when the application is introduced and for ensuring continuity of operations when new staff are hired. The background information and procedures needed to run an application are recorded in the manual.

- **More efficient systems.** Thorough documentation saves time by providing information when and where it is needed, thus reducing the number of errors made (and consequently reducing the number of keystrokes).

- **Lower maintenance costs.** Technical documentation can provide both the context and details for programmers who need access to information on all aspects of an application.

- **Marketing,** indirectly. Good products (well-developed systems with quality documentation) enhance your department's reputation.

With higher education budgets become tighter, quality documentation is increasingly important in application development, as information systems departments search for ways to more efficiently and effectively deliver their services. MIT has found that thorough manuals and other documents produced by a professional writing group are critical to the success of applications developed by its Administrative Systems Development group. Quality documentation has immediate payoffs — by improving the effectiveness and usability of newly implemented applications — as well as long-term benefits — by providing technical documentation for maintenance and ensuring continuity of operations in case of staff turnover or emergency situations.

ISSUES IN THE DEVELOPMENT OF A CAMPUS COMPUTING AND INFORMATION POLICY

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ABSTRACT

The growth and expansion of information technologies on campuses across the country has caused many universities to begin to develop (or modify existing) information policies. Many schools have begun to implement campus-wide information systems which are used by the majority of people on their campuses. Questions concerning moral, ethical, and legal obligations have arisen, which in the past have been overlooked or not even considered. Lehigh having implemented a campus-wide information system which is used by over 95% of the campus, has had to develop an Information Policy to address the growing campus concerns relating to the appropriateness of publicly available electronic information.

Lehigh's Information System allows individuals to post information without any filtering to both on-campus and off-campus messaging systems. While these facilities are very useful, they have raised serious concerns relating to system resource management, possible legal liabilities concerning the nature of the information, and also the placement of materials that are obscene and offensive. The following issues relating to the development of Lehigh's Information Policy are discussed: possible legal liabilities, censorship, resource management, information ownership, user responsibilities, and the approval chain.

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INTRODUCTION

Between 1985 and 1986, Lehigh distributed microcomputers to its entire faculty and placed hundreds of microcomputers at its public sites. Connectivity to Lehigh's computer systems was provided through a digital PBX with over 8000 data connections. During this time, Lehigh also decided that one real value of all this connectivity would be to provide information resources to the entire community. A project was developed in the spring of 1986 to provide information resources to the entire Lehigh community. The on-line information system would serve as a centralized communication facility for the campus. Development work on the system was begun in May of 1986 with availability for the entire campus in January of 1987. This system, called LUNA (Lehigh University Network Applications), provided the following services: centralized electronic mail, bulletin board and conferencing facilities, access to external networks, on-line forms processing, access to high quality print services, and on-line survey facilities. The system has been highly successful [1]. Accounts on the system have grown from 200 in January of 1987 to over 6700 individual users in March of 1990 (see Figure 1). It should be noted, that users open their own accounts on the information system by running a program. This program also provides an electronic agreement to our information policy.

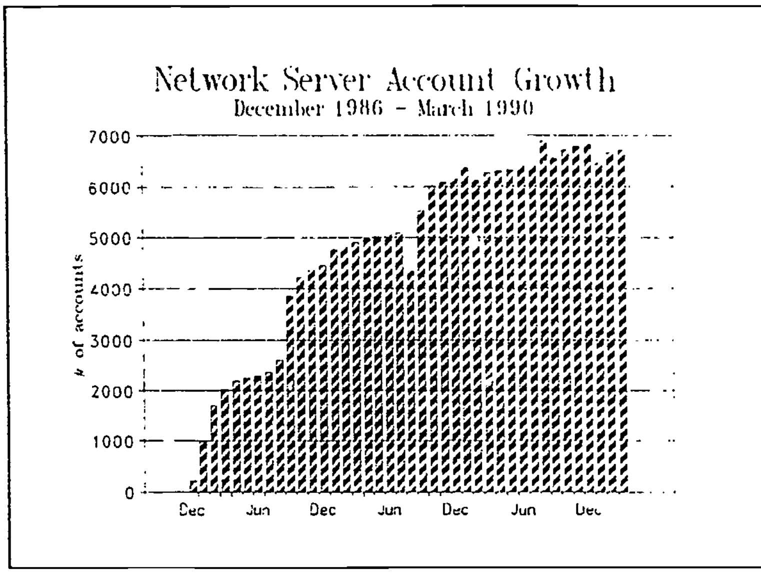

Figure 1

INFORMATION MANAGEMENT

The function of information management is distributed throughout the campus to the individuals, groups or departments responsible for the information. Information posted on the system for general access is monitored by the person responsible for the specific information. This person must have the approval of a faculty member, department head, or group advisor before being allowed to post information. This method of information management has resulted in the establishment of over 300 Information topics over the last four years. For example,

- The Research Program Development Office maintains a bulletin board of research funding opportunities.

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- The Student Affairs Office utilizes the on-line survey facility to get feedback on the quality of education at Lehigh.

- The faculty software committee participates in a conference on software funding requests.

- The Computing Center maintains electronic libraries of public domain and site-licensed microcomputer software.

- The Human Resource Office maintains a listing of all available jobs on campus.

- The Library maintains on-line forms for interlibrary loans, Media Center request, and bibliographic search and reference questions.

Figure 2 shows some of the more popular topics and the number of times they were accessed over a one month period. As can be seen, the most popular topic on campus is items for sale. This topic has the most general appeal. The second most used topic is file transfer. Its popularity is due, in part, to the large amount of public domain and site license software available for downloading. It should be noted, that other items such as interlibrary loans which did not make the list had over 100 requests processed electronically per week.

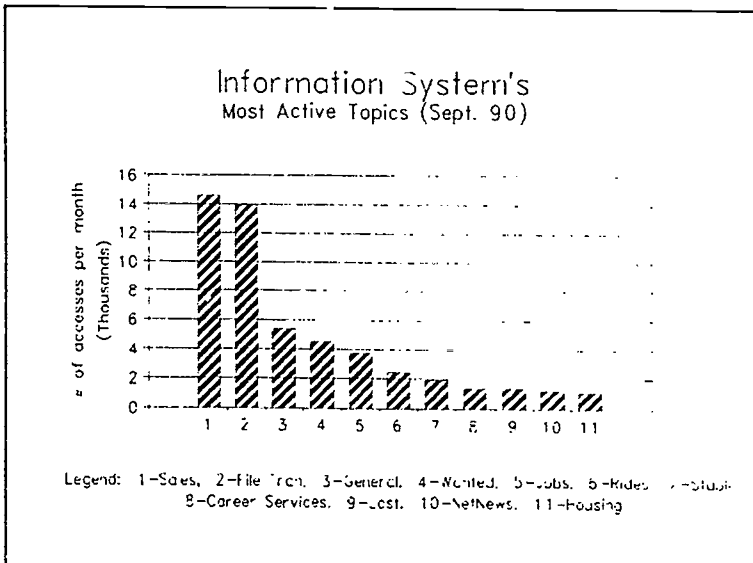

Figure 2

Initially, very restrictive controls were placed on an individual's ability to post publicly available information on the system. These controls have been relaxed to allow the instant posting of messages to conference and bulletin board areas. After a series of instances involving obscene, abusive, and offensive postings, the Computing Center realized that its current computer policies did not fully address many areas of abuse that were occurring on the information system. One student, for example, posted a message describing techniques for killing cats under our LITFORUM conference which was sponsored by an English professor. Lehigh's president then received a call from a local animal rights group asking that the message be removed. Another example, was the Human Diversity conference which discussed issues of homosexuality. After some very abusive comments to the conference, the Computing Center received a call from the Dean of Students enquiring about the faculty member responsible for the conference. Strange

as it may seem, the chaplain was the faculty member responsible for the conference.

Due to the large user base, the Computing Center felt that any policy decision regarding what was and was not appropriate on the information system should be based on a faculty, student, and staff recommendation rather than have users think that the Computing Center had arbitrarily decided what information should and should not be posted.

Once Lehigh decided to make the information from Usenet publicly available, the off-campus materials being posted on its system became an issue. The topics on Usenet range from discussions on sexual bondage (hot sex) to cold fusion. Control of the postings in individual topic areas was virtually impossible due to the magnitude of the information received, about 500 megabytes per month. Quotes such as:

> "The age of innocence is gone. Running a bulletin board means taking on certain legal and moral obligations." Jonathan Wallace a New York based attorney specializing in technology law. [2]

> "Running a BBS is becoming a business. And with that maturity is going to come a lot of potential legal liability." Paul Bernstein a Chicago attorney. [2]

> "One could see the headlines now X University found guilty of providing X-rated materials to minors" (Usenet message posted by a 16 year old attending Rutgers).

made the Computing Center more aware of the possible legal liabilities that the University might face in regards to information posted on their computing systems.

LEGAL LIABILITIES

Is the university responsible for publicly available information placed on its computer systems? Wallace and Morrison state that Information System operators should take "reasonable" steps to discover and remove any types of illegal material or libelous information that have been placed on an Information System [3]. The following are examples of illegal materials which may lead to a lawsuit or criminal charges: (1) pirated software, (2) credit card numbers, (3) "Trojan Horse" programs, (4) pornographic materials, (5) trade secrets. Knowing that the actual monitoring of the information on the system would be unmanageable by one group, the Computing Center has made each bulletin or conference coordinator sign an authorization form in which they agree to following the guidelines of our Information Policy.

The consequences of having illegal or "alleged illegal" material on your information system can be seen in the March 1, 1990, seizure by the Secret Service of 40 computers and 23,000 diskettes from Steve Jackson Games, an Austin Texas manufacturer who had a game that was described as a handbook for computer crime [4]. The Electronic Frontier Foundation (EFF), which was established by the Lotus Development Corporation founders Mitch Kapor and John

Barlow is trying to get the government to fully disclose all the facts of the seizure. The foundation was establish to address the social and legal issues associated with computer communication and information dissemination [5].

The Information Policy should also inform users of their legal liabilities. Many users are unaware of the serious nature and possible consequences of their actions and should be made aware of both federal and state laws involving computer abuse. An Information Policy should give examples of laws and penalties that can be incurred. For example Lehigh's Information Policy includes the following statement:

> Under Pennsylvania law, it is a felony punishable by a fine of up to $15,000 and imprisonment up to seven years for any person to access, alter or damage any computer system, network, software or database, or any part thereof, with the intent to interrupt the normal functioning of an organization (18 Pa.C.S. 3933(a)(1)). Knowingly and without authorization disclosing a password to a computer system, network, etc. is a misdemeanor punishable by a fine of up to $10,000 and imprisonment of up to five years, as is intentional and unauthorized access to a computer, interference with the operation of a computer or network, or alteration of computer software (18 PA.C.S. 3933(a)(2) and (3)).

CENSORSHIP

Does the university have a right to "censor" information which is posted on its computing systems? Should the university set standards for topics to be discussed or language to be used in computer communications? Lehigh decided that the answer to both of these questions was yes, when they applied to any publicly available information. An analogy can be made to the publisher of a magazine that shapes the content of its articles based on certain standards. Information posted on our computing systems that is publicly available to the entire Lehigh community would have to follow the guidelines posted in our Information Policy. An underground electronic press has sprung up as a result of the private conferencing facility that was made available to our users. Private messages and conferences are not subject to our information policy unless the messages infringe on another person's rights or are clearly illegal. Some examples are: the sending of abusive or obscene mail or the private conference that gave step-by-step instructions on building an HBO decoder. In general, the Computing Center feels that private messages and conferences are the responsibility of the individuals involved and does not monitor private mail or private conferences.

INFORMATION OWNERSHIP

Text files, messages, and programs placed on our information system are regarded as the property of the sender. Users are advised that they must abide by all copyright laws with regards to programs and text files. For example, the practice of excerpting magazine or newspaper articles and placing them on an information system is technically a violation of copyright laws and is not allowed.

The Computing Center regards all private messages and files as belonging to each individual user. The Electronic Communications Privacy Act of 1986 (ECPA) makes the disclosure of any private messages to a third party a federal misdemeanor. The Electronic Mail Association has recently issued a white paper recommending that companies adopt a formal policy regarding the privacy policies of all media communications [6]. Lehigh's Information Policy does allow for the monitoring of individual files when there is a clear threat to system security by an individual, but not without prior approval by the Director of the Computing Center. It is important for users to understand that private communications will not be monitored without extenuating circumstances.

USER RESPONSIBILITIES

Part of the development of any information policy is the mechanism that needs to be in place to inform users of their responsibilities to abide by these policies. As stated previously, it is important for users to be aware of the seriousness of computer abuse and information regarding the laws associated with computer abuse. These laws should be clearly stated in an information policy. At Lehigh, our Computing and Information Policy statement is agreed to by the user when they first open an account which accesses our Information System. The policy is also contained in the Student Handbook, "Intro to LUCC", and on authorization forms for other computers. Conference and bulletin board moderators also sign a form agreeing to regularly monitor their topic areas to make sure that they are in compliance with the Computing and Information Policy.

RESOURCE MANAGEMENT

Resource management covers many areas which must be addressed in a policy statement. Users must be informed of the consequences of sending unsolicited junk mail such as chain letters. They also must be informed of the consequences of computer hacking and unwarranted use of systems resources such as excessive printing or creating unnecessary network traffic.

As an information system gains in popularity as a tool for campus-wide communications, users begin to make special requests for mass mailings, login messages, or even special placement within the information system. A policy must be developed and the information system manager must cope with the political aspects of information flow management where one must try to minimize "junk mail" while maintaining a good working relationship with university constituents who feel that the information they want posted is very important to everyone. With over 5000 logins per day, the Computing Center has tried to follow the policy of only posting login messages or sending mass mailings that are relevant to the user community at large (see Figure 3). This policy does get modified at times, however, depending on who is asking for the login request or mass mailing. In these cases, the Computing Center informs the user community of the sender of the message so complaints about "junk mail" can be directed to the requestor and not to the Computing Center. Another request that is frequently made is for placement on the

main Information and Services menu. Our policy on this is to keep all departments off the main menu except for the Research Department and the Library. These two departments along with the Computing Center were the first users of the Information and Services facility and provided the Center with useful application ideas, such as on-line forms and the overall bulletin board structure. They also helped the Center market the system by providing incentives such as research coffee mugs for accessing the research bulletin board and special documentation of the Library services provided on the information system. Requests for special placement have also been reduced by the implementation of an update facility which tells a user what topics have changed within any specified time frame.

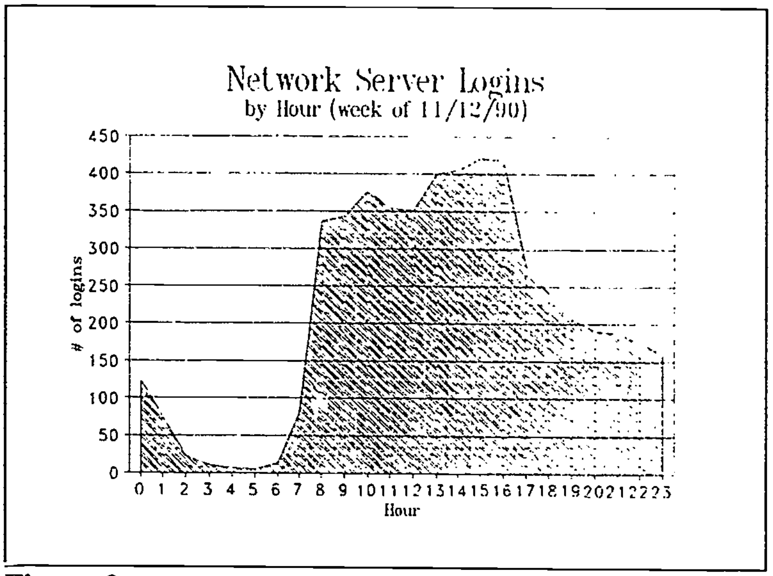

Figure 3

Another concern in resource management was the traffic created by a larger external information systems such as Usenet, which can create over 500 megabytes of information per month. The Computing Center initially withheld Usenet availability due to the large amount of traffic and the nature of some of the postings. The Computing Center's Advisory Committee recommended that the Center only make topic areas available that were directly related to the educational process. Other topics could be added, but they had to be requested by a faculty or staff member.

APPROVAL CHAIN

Following the proper approval chain is important in an university environment. Making sure that one's superiors are aware of the possible consequences and problems associated with running and maintaining an information system is critical. At Lehigh, the first step in the approval chain is our Computing Center Advisory Committee (CCAC), which is composed of faculty, staff, and students. Having the CCAC approve and shape the content of the information policy also lets users know that the policy was derived from their representatives rather than just being arbitrarily implemented by the Computing Center. Our policy statement was approved by the CCAC with a recommendation that it be reviewed by the University's legal representative. The Provost, however, felt that the policy statement only needed the CCAC's approval and that legal opinions were unnecessary.

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In general, it is probably best to have the Information Policy approved at the highest level possible at your institution and also to have the document reviewed by the institution's attorneys to try to minimize any possible legal liabilities. Contacting the school's risk management department and internal auditor might also be useful concerning the content of the Information Policy.

LEHIGH'S CURRENT POLICY STATEMENT

Those who do not abide by the policies listed below should expect suspension of computer privileges and referral to the University Committee on Discipline.

Offenders may also be subject to criminal prosecution under federal or state law, and should expect the Computing Center to pursue such action. As an example, under Pennsylvania law, it is a felony punishable by a fine of up to $15,000 and imprisonment up to seven years for any person to access, alter or damage any computer system, network, software or database, or any part thereof, with the intent to interrupt the normal functioning of an organization (18 Pa.C.S. 3933(a)(1)). Knowingly and without authorization disclosing a password to a computer system, network, etc. is a misdemeanor punishable by a fine of up to $10,000 and imprisonment of up to five years, as is intentional and unauthorized access to a computer, interference with the operation of a computer or network, or alteration of computer software (18 PA.C.S. 3933(a)(2) and (3).

The Computing Center should be notified about violations of computer laws and policies, as well as about potential loopholes in the security of its computer systems and networks. The user community is expected to cooperate with the Computing Center in its operation of computer systems and networks as well as in the investigation of misuse or abuse. Should the security of a computer system be threatened, user files may be examined under the direction of the Computing Center Director.

The Center's computer resources and facilities are solely for the use of Lehigh (registered) students, faculty and staff, with the exception of those paying to use mainframe applications which are otherwise unavailable locally.

POLICIES

The Computing Center's policies include but are not limited to the list below.

1) You must not use a computer ID that was not assigned by LUCC to you, unless multiple access has been authorized for the ID by LUCC. You may not try in any way to obtain a password for another's computer ID. You may not attempt to disguise the identity of the account or machine you are using.

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2) You must not use the Computing Center's network resources to gain unauthorized access to remote computers.

3) You must not deliberately perform an act which will seriously impact the operation of computers, terminals, peripherals, or networks. This includes but is not limited to tampering with the components of a local area network (LAN) or the high-speed backbone network, otherwise blocking communication lines, or interfering with the operational readiness of a computer.

4) You must not attempt to modify in any way a program diskette which the Computing Center supplies for any type of use at its sites.

5) You must not run or install on any of the Center's computer systems, or give to another, a program which could result in the eventual damage to a file or computer system and/or the reproduction of itself. This is directed towards but not limited to the classes of programs known as computer viruses, Trojan horses, and worms.

6) You must not attempt to circumvent data protection schemes or uncover security loopholes.

7) You must abide by the terms of all software licensing agreements and copyright laws.

8) You must not deliberately perform acts which are wasteful of computing resources. These acts include but are not limited to sending mass mailings or chain letters, obtaining unnecessary output, creating unnecessary multiple jobs or processes, or creating unnecessary network traffic.

9) The following types of information or software cannot be placed on any system on- or off-campus:

   * That which infringes upon the rights of another person.
   * That which is abusive, profane, or sexually offensive to the average person.
   * That which consists of information which may injure someone else and/or lead to a lawsuit or criminal charges. Examples of these are: pirated software, destructive software, pornographic materials, or libelous statements.
   * That which consists of any advertisements for commercial enterprises.

10) You must not harass others by sending annoying, threatening, libelous, or sexually, racially or religiously offensive messages.

11) You must not attempt to monitor another user's data communications, nor may you read, copy, change or delete another user's files or software, without permission of the owner.

12) You must not use any of the Center's microcomputers, workstations or networks for other than a Lehigh University course, research project or departmental activity. These resources

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must not be used for personal financial gain unless in support of a Lehigh University research or departmental project.

13) You must not use a computer account for work not specifically authorized for that account. A University-funded account may not be used by its requestor for personal financial gain.

14) You must not play games using any of the Center's computers or networks, unless for instructional purposes as specifically assigned by a professor.

The above policies supplement the University Code of Conduct, which covers such acts as theft of computer services (including copyrighted computer programs), theft or mutilation of Lehigh property such as equipment, and the unacknowledged or unauthorized appropriation of another's computer program, or the results of that program, in whole or in part, for a computer-related exercise or assignment.

Software developers should refer to the "Procedure on Software Disclosure and Development" regarding title rights.

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3. J. Wallace & R. Morrison, Syslaw (LLM Press, NY, 1988)

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THE RIGHT MIX: ATMs AND VRUs IN THE ADD/DROP PROCESS

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The add/drop process usually occurs during a concentrated (and often frantic) period of time. If the time period or methods of access could be expanded, the add/drop process would be less of a burden to students and staff. As part of "Project Glasnost" at Boston College, we have combined VRUs (Voice Response Units) with cashless ATMs (Automated Teller Machines) to allow students to change courses and list their class schedules easily.

Voice response units allow students to phone in their course changes starting six weeks before the beginning of the semester. To list their courses, students may listen to the list of their courses on the phone. However, most students still want a paper copy of their schedule. Students then turn to our cashless ATMs (with 80-column printers) to print out their full course schedules. Both VRUs and ATM's require a Personal Identification Number.

By combining the two technologies with traditional "in person" service, student access is enhanced and the load is distributed over time and devices.

Project Glasnost - Opening up Access

Several years ago Boston College started "Project Glasnost", a long-range project to open up the mainframe computer to the the university community, especially the students. In February 1989 we became the first university to allow students to access their courses, grades, schedules, student loans, student accounts, and other information via a cashless ATM (Automated Teller Machine). The overwhelming success of the ATM (40,000 inquiries per year) encouraged us to find other ways for students to become active participants in the management of their records.

We Hate Standing in Line

When we asked students and administrators what the most important problem was in servicing students, the cry was almost universal: "Can you please do something to eliminate waiting in long lines?" The natural bottlenecks created by registration and add/drop drew the biggest complaints.

Bottlenecks were due to these factors:

- All 8000 undergraduates had to go through registration at one central site. Many students returned during add/drop period to change courses.
- Registration and subsequent add/drop periods were concentrated in a short period of time.
- Even with assigned registration times, students arrived early to make sure they didn't miss their "slot".
- Since add/drop period had no assigned times, students lined up early in the morning hoping to into a course.

Possible Solutions

No all problems can be solved by a high-tech answer. Some may only require a low-tech solution. Long lines are created because more people arrive at a destination than there are people to service them. A low-tech answer is to simply extend the time period. This will work with registration because people can be notified to appear at a designated time. But add/drop is a basic free-for-all. Students cannot be assigned to times because the process is dynamic. A course that is closed today may be open tomorrow. Students want to be able to try several times to get the courses they want.

Add/drop seems to require a high-tech solution. If a staff person could be replaced by a VRU or ATM, maybe the demand could be satisfied. Boston College students have been using cashless ATMs to get a printout of their courses, schedules, grades, and financial information. Perhaps we could use the ATMs for adding and dropping courses? At first it seems natural. The security is already builtin, all courses have unique index numbers, and the students could get an immediate course printout. However, now we have simply moved the lines from the registrar to the ATMs. Not only would students be waiting in line again to add/drop, but other students who only want to look up financial information would be stuck in the same lines. It was decided that the ATMs would continue to function to dispense information, not update it.

However, VRUs seemed more promising. Instead of servicing one student at a time, one VRU could handle many students simultaneously. If demand exceeded one VRU, they could be "chained" together. The students would call one number, and the phone system could "hunt" for the next available VRU line. Now the limiting factor was the number of incoming lines to the university that could be dedicated to the VRUs. The main drawback to voice technology is that is not visual. Things have to explained linearly, not spacially. And of course, students could not get an instant printout over the phone, but they could get one the next time they visited one of the campus ATMs.

Human Factors

In designing a new system we realized that not all students would or could take advantage of new technologies. Voice registration certainly helps the majority of students who have straight-forward course requirements. But some students will be required to have written permission from departments to take certain courses. Some students have "holds" on their registration that require visits to the registrar or student accounts offices. Some require special overrides that can only be resolved by visiting the registrar. And then others simply want to talk to a human being.

Interestingly, even students who are comfortable with phone registration still wanted a printout of their courses. It seems to be a needed reinforcement to "get it on paper".

It was decided that human factors dictated that a new system would include the following:

- Students would be allowed more that one method to register and add/drop courses: in-person and VRUs.
- To assure equal access, both systems would access and update the same mainframe files.
- Students wishing an immediate confirmation of their schedules could visit the ATMs on campus. Others would be sent a confirmation via a batch program.

Technical Factors

Of course wishing for an easy solution does not make it reality. Technical problems of resources had to first be solved. We had to look at the impact on the mainframe (CICS) as well as the increased phone traffic.

After some initial tests, we concluded that the CICS and the mainframe could easily handle the increased file accessing. However, we would need to limit the hours that students could call in order to do our usual batch processing at night. We were updating files real time. We didn't feel that the creation of redundant files was worth the extra convenience of calling 24 hours per day.

Our main concern centered around the increased phone traffic coming into the university. We had two VRUs: the IBM 9274 (12 incoming lines) and the IBM 9270 (4 incoming lines). We needed to make sure that the amount of calls coming into the university did not tie up all the lines. But we also needed to service the students so that we didn't cause "lines" waiting for the VRU lines to be free.

Technical considerations prompted the following set of restrictions:

- The VRU could be called between 8 a.m. and 7 p.m.
- The overall add/drop period would be extented to begin 6 weeks before the beginning of classes, immediately after advanced registration. By lengthening the period, we hoped to reduce the number of calls per hour.
- If more calls were received than the VRU could handle, a pre-recorded message would say to hang up and call back or come to the registrar's office. The recording was programmed into the phone system, and it could be changed at any time, independent of the VRU.

Security Factors

All access to the VRU and ATM required a PIN (Personal Identification Number) as well as the corresponding student ID number. The VRU required the entry of the student ID, while the ATM required the insertion of a student ID card with an encoded ID number.

Students were notified of their PIN when becoming a student. If they forget their PIN, they may go to a designated office and receive their PIN if they presented their picture ID card. The procedure is administered by the the MIS security administrator. Request for new PINs require a written request and a 1 day turn around

Acceptance of System

The VRU was tested on a small group of political science majors during August 1990. The response was enthusiatic from the students and the registrar.

In November of 1990 we started allowing all 8000 undergrads to register and add/drop via the phone (as well as in person). 3/4 of the students used the VRU, but many still required the services of a staff person.

Students were allowed to add/drop as soon as they had registered. During registration period, 100 students per hour were scheduled. The VRUs could accommodate approximately 125 calls per hour using 15 incoming lines. As can been seen on the following chart, many students called back to try to rearrange their schedules during the November 1990 registration period:

NUMBER OF TIMES STUDENTS CALLED	PERCENTAGE OF CALLS
1	59%
2	22%
3	8%
4	4%
5 or more	7%

As of this writing, add/drop period is still in progress. Since November registration period is over, it is hoped that the VRU traffic for add/drops will not exceed 125 per hour.

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Future Enhancements

VRUs are clearly a step in the right direction. They allow better throughput than in-person add/drops. However, VRUs depend on a person understanding directions by hearing, not seeing. But this is a "visual" society. Most people use sight more than hearing to process information. Probably the best way to self-register and to add/drop is to use a terminal or personal computer with a modem. Computer screens allow the student to "paint" in the whole schedule at one time, instead of entering one at a time via the phone. Terminals can give more options to the students when a course or its corequisite is filled up. Unlike the phone, terminals are not time-sensitive: you can stay on the terminal as long as you like without seriously impacting another student.

In a test project we allowed about 300 student employees to register and add/drop via terminals in their offices. The overwhelming response was that this was even better than using the phone. Remember, these students were very familiar with the terminals. However, because most students are not familiar with the IBM keyboards (especially cursor keys), we realized that a "front-end" would have to be designed to facilitate terminal use for novices. The front end could be created on a MacIntosh to take advantage of the point-and-click technology.

But not all students have the same access to terminals or PCs as they do phones. We have to be concerned that we have a common playing field. So it seems that the future will bring three kinds of registration access: in person, phones, and terminals. As long as their is equal access, students should be able to make the choice that fits their circumstances.

CAUSE90
MIAMI BEACH
NOVEMBER 27-30, 1990

TRACK V

MANAGING TELECOMMUNICATIONS AND NETWORKING

Coordinator: Con Dietz, Illinois State University

Communication may be replacing computation as the most critical service within our higher education institutions. Papers in this track address such subjects as network funding, support services, access to networks, improvement of instruction through networks, and image transmission.

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WHAT'S NEW IN TELECOMMUNICATIONS?

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Tallahassee, Florida

ABSTRACT

PBXs, LANs, CSMA/CD, ISDN, FO, FDDI, and the list goes on. How's a person suppose to keep up with all the advances in computing, much less telecommunications? The fact is we don't! But, this layman's terms presentation is designed to provide you with an update on the typical issues and technologies facing us in telecommunications today.

The data for this presentation was collected from a survey of 128 college and university telecommunications departments which makes it "real world" and current. Highlights include: How does a fiber optic backbone fit the campus networking strategy? What does ISDN means to me? Which LAN configuration is most popular on campuses?

In addition to the national data, case briefs of Florida State's will be interspersed in the presentation.

INTRODUCTION

The year is 1984. The place is the U.S. District Court in Washington, D.C. The judge is the Honorable Harold H. Greene. The decision is to deregulate the telecommunications industry and AT&T consented to divest. Since that date, life on the campus has not been the same. Slowly at first, but now like a locomotive, colleges and universities across this land are taking control of telecommunications.

Most of us in the technology business have realized that it is a lonely world in which we live. We see opportunities. We try to sell "management" on them. Yet these are expensive decisions that we are trying to get them to buy into. And the technology changes so fast that they worry whether it will be obsolete before we get it installed.

Yes, bless their hearts, our bosses are uneasy about technology decisions because they simply did not grow up in the electronic age. And I am one of them. Think on us kindly. We, those of us who are in management positions in colleges and universities today, grew up with the following handicaps -- our phone numbers were something like "39W" and we reached parties through an operator on our dial-less black phones; when we visited Grandpa's Kentucky farm, we answered "two longs rings and a short" on the oak-cased, party-line phone; and the most sophisticated technology in the home was a vacuum tube radio and we didn't even think about it being AM only.

Is it any wonder that you young "whipper-snappers" have trouble selling new telecommunications systems on campus?

THE SURVEY METHODOLOGY

The First Survey

Realizing that our managers respond well to peer information, I decided to ask our ACUTA colleagues for some hard evidence to advance our cause. And, since most of us want to progress as broad a front as is feasible, I developed a survey that would collect data that could be used to demonstrate to my boss that we should do these wonderful, new, innovative things. Thus, in the Summer of 1988, I conducted my first survey of twenty-four ACUTA members.

The 1990 Survey

The response to the first survey was so encouraging that I decided to seek another level of management data about campus telecommunications operations.

A seven-page survey instrument was developed in Spring 1990 and sent out somewhat randomly to 151 ACUTA members. It achieved an outstanding reply rate of 60 percent, or 90 respondents, and generated the data for a presentation at a recent ACUTA national conference, results of which CAUSE published as a Professional Paper. (1)

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The Enhanced 1990 Survey

Happily, I can report that the survey data was well received at the annual ACUTA conference. However, the bad news is that some of the attendees felt that the data might have been skewed by the responses from larger universities. To correct the flaw, a copy of the survey was sent to each college and university attending the ACUTA conference that had not been previously surveyed. Ninety-two of these additional surveys went out in July. By Labor Day, 38 more responses (a 40% response rate) were added to the previous data base to make a total of 128 colleges and universities.

The Survey Instrument and Findings

So, what follows is not so much "What's New in Telecommunications?" but WHAT'S NORMAL? From the paper, you will be able to pull together a picture of campus telecommunication activities and get a feel for normal or average activities.

SWITCHING CAPABILITY

Getting into the Campus Phone Business

The deregulation of the telephone industry gives colleges and universities freedom of choice. But, it also poses one of the biggest dilemmas -- whether to subscribe or continue to subscribe to Centrex service or acquire a private branch exchange (PBX). In other words, should the campus use its local telephone company to provide phone service or acquire a switch (PBX) and become its own "mini-telephone company." Thus, in simple words, we are looking at "Centrex" versus "PBX."

The Trend Toward PBXs

Little data exists as to the number of campuses with Centrex service versus those with their own PBX at the time of divestiture. A good guess would be that ten percent or lower had PBXs.

One thing that we do know is that in 1990 a majority of the larger institutions opted to have their own switch. The survey indicated that 69 percent owned their PBX, while 31 percent used Centrex service. It does not seem to matter whether the institution is small or large, a ratio of two to one seems to prevail.

The Vendor of Preference

There are two giants battling it out to be the dominant switch vendor. AT&T is the name most of us recognize and the other is a Canadian firm called Northern Telecom, Inc (NTI). In terms of providing Centrex service, the Northern Telecom DMS-100 digital switch is the clear leader with the campuses surveyed. When it comes to picking a PBX for the campus, the preference is one of AT&T's models. But, as seen by the percentages below, no particular switch turns out to be the dominant choice.

CENTREX		CAMPUS PBX	
49%	Northern's DMS-100	34%	AT&T's 25, 75, 85, & Dimension PBXs
46%	AT&T's SESS	29%	Others: NEC, InteCom, GTE, Ericsson
5%	Others: Nova & "other"	27%	Northern's SL-1 & SL-100
		10%	Rolm's CBX & Model 9751

However, based on these percentages of campus market share, a safe choice would have to be Northern Telecom or AT&T. And both have been in the bushiness long enough to give confidence to the notion that they will be around for years to come.

The Integration of Voice and Data

Whether it is Centrex service or an owned PBX, it is safe to say that the overwhelming number of them are digital switches. This means that all of the internal circuitry is handling signals in binary, just like another computer. Further, it can be said that they were designed to handle data as well as voice communicating. And, this has been so for a decade and a half. The sales pitch has been to buy one switch that handles both.

But in fact, vendors have had few takers. In the early years, campuses acquired data switches for data communicating and a PBX for voice needs. Even today vendors still talk about how easy it is to run voice and data through the same PBX, but those who do exploit integrated voice/data (IVD) are few in number.

During the Fall '88 survey process, it was learned that Northern Telecom tried to sell customers on integration but in practice less than 2 percent of it's customers actually acquired the IVD instruments (make that "phones"). The universities reported an even lower number. The twelve universities with Northern Telecom PBXs reported that only about 1 percent of the proprietary phones which they acquired were the IVD type.

So, how do we handle data?

It seems that we can generalize our data options into three categories --modems, data switches, or voice/data PBX. For decades, campuses have used modems (modulator/demodulator) to connect workstations to computers via telephone lines. We have them that range in speed from 300 bits per second (bps) on up to 19,200 or 19.2K bps.

In the late '70s, the data switches, such as those made by Gandalf and Micom, gave rise to the establishment of separate data networks. These systems use twisted-pair cabling and achieved data rates of 9.6K bps to 19.2K bps.

Finally, the "digitation" of the switch/PBX brought an important capability to users. With a digital PBX, users gained the ability to be connected simultaneously to data signals and voice or a voice/data PBX.

Now, against this background, we can see what campuses are doing.

Low-speed Data via Modems	44%
Separate Voice & Data Networks	39%
Integrated Voice & Data via PBX	19%
Low- to Hi-Speed Data via PBX	14%
Low-speed Data via PBX	9%

Note that these percentages total to more than 100 percent. This occurs because many of the campuses report several different ways of handling their voice and data needs. From these data, two things leap to our attention. First, there is still a considerable amount of low-speed modem use on campuses today -- 44 percent. And, secondly, the data switches that were so popular fifteen years ago are still very much present on the campus -- 39 percent. The big hope is that more and more campuses will move to the integrated voice/data switch, which is a capability that is moving up into third place, or 19 percent.

NETWORKING

Networking. Whatever that is!

Doing some networking? Whether we call it networking or local area networks (LAN), selecting the scheme for your campus is no simple task. Today's networking/LAN marketplace is crowded with at least fifty different vendors, all claiming that their product is the one you need. Further, confusion occurs because there are few fixed standards, de facto or otherwise. Nonetheless, you may be sure that the simple, small LAN you install today will turn into a large multifloor, multibuilding, or multicampus network at some time in the future.

The Campus Communications Picture

Not sure of how to ask the LAN question in order to get a definitive and clear picture of campus networking, the question was posed, "What best describes your campus?" Note the frequency of responses to the left of the following descriptions.

80 A campus backbone
60 A loose confederation of LANs w/ computer center data circuits
48 Administrative and academic computing on separate networks
3 A data switch
16 Integrated voice and data network

As mentioned earlier, the most curious response is that the vast majority of the campuses see themselves with a "campus backbone." Yet, from the responses about data rate and the use of different media, these are most likely coaxial networks or maybe even some using twisted pairs. Probably less than a dozen of the campuses surveyed are using fiber backbone.

The Typical Data Rate on Campus

The most popularly reported data speed is 9.6K bps at 56 institutions. Add that to the lower speeds reported and we find 97 out of 128 campuses at 9.6 and slower, 13 at 4800 bps, 21 at 2400 bps, and 7 at 1200 bps. Of those campuses which reported high data rates, it is encouraging that 11 are at the 1OM bps speed.

Optical Fiber -- The Ultimate Transmission Technology!

Although fiber is making its mark, copper, as in twisted pairs, will continue to be the basic method for delivering services in the office during this decade. With our campus buildings full of twisted copper telephone cables, it represents a valuable resource for networking that is cheap, light weight, flexible, and easy to install. More importantly, it will support most of the popular networking protocols and configurations. Coaxial cabling, which is 14 times more expensive than twisted pair, provides a far broader transmission bandwidth, but it is less flexible and heavier. (2)

Here's the FDDI Scoop!

It's a little early to get excited about FDDI, but it won't hurt to know enough about it to ask a few good questions. FDDI (Fiber Distributed Data Interface) is a developing standard for large backbone LANs that is configured as a counter-rotating ring operating a 1OOM bits per second. It is intended to support up to 1,000 connections and support a total fiber length of 200 kilometers. This is now a "developing standard" but expect it to play a role in campus networking plans in the '90s. (3)

ISDN! "Do I have to know?"

Put simply, ISDN (Integrated Services Digital Network) is a modest set of broad technical recombinations for a common user interface to digital networks. The "integration" part applies to the goal of combining separate networks into a single, high-speed common facility--like your local telephone company's system. The concept envisions breaking out 64K bps channels for all types of transmission from voice to slow-scan television. Again, this is a standard, in the making, that will play a role in our campus communications plans.

For some of us, there isn't room in the old think box for many more acronyms, so do I need to know about ISDN, too? If you need a more detailed understanding, you can read 1,000 word articles in CAUSE/EFFECT and Procomm, written just for the layman. (4)

LAN Topologies

Increasing the difficultly in understanding LANs, we select the LAN components and mix them with several topologies and protocols, in various combination, to implement a LAN.

Here is a quick summary about LAN topologies. The basic topologies are: bus, ring, and star. However, in practice, we find a number of hybrid topologies. Networks with the bus topology sometimes are called backbone networks because they connect

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each device to a central cable called the backbone. A ring topology network connects each station to those on its left or right. Regardless of the topology -- ring, bus, star, or hybrid -- every message contains a designation address and each station on the network "listens" for its address in each message.

LAN Protocols

A LAN protocol is the set of rules, procedures or conventions that relate to the format and timing so that two or more points can communicate with one another. Associated with the protocol decision is one concerning whether the system will be baseband (one message at a time) or broadband (multiple message passing).

To ascertain what was being used by campuses to control their networks, the survey question was, "What protocols were used most prevalently on campus?" And, we must confessed that not all possible protocol options were listed, in an effort to keep things simple.

The most commonly reported protocol is TCP/IP (Transmission Control Protocol/Internet Protocol), with a frequency of 60 campuses. It is probably the oldest networking standard and allows reasonably efficient and error-free data transmissions. Recall that it comes to us through development at the Department of Defense's Advanced Research Project Agency network project known as ARPANet.

With an abundance of IBM hardware on campuses, it should not surprise you that IBM's Systems Network Architecture (SNA) has a significant presence. The IBM protocol used under this Architecture is Synchronous Data Link Control (SDLC) protocol. Yet, when one asks about campus LAN protocols, it is common to refer to it as SNA rather than SDLC. Recognizing that option, SNA was reported as the second most popular option with 38 campuses reporting its use.

Again, considering the amount of Digital Equipment Corporation (DEC) hardware on college campuses, it should not come as a shock that DECnet is the third most popular protocol with 8 campuses reporting.

LAN Operating Systems

As mentioned earlier, the techies who work on our LAN systems do not have a common vision of the hierarchy associated with LANs. So, when we asked about the most prevalent LAN "Operating Systems" on campus, we were really asking about the "LAN software" or "LAN application software." One of these days, we may be able to use architecture, protocols, and software as distinct categories and people will know what we mean. In the meantime, let's report the findings on "operating systems."

Novell's NetWare is the clear choice of LAN Operating Systems with 94 out of 128 campuses reporting that it is the most prevalent one used.

Apple Talk is in second place with 62 votes. Again, Digital is in third place with VMS/DECNet (45). The others include: DOS LAN Manager (18), 3 COM Plus (13), and Banyan VINES (10).

ORGANIZATIONAL AND MANAGEMENT ISSUES

A New Function--Telecommunications

Prior to deregulation/divestiture (1984), campus telephone service was typically a small operation down at the Physical Plant Department that coordinated the phone and data circuit requests with the local phone company. A telephone administrator and a few clerks ran the show.

During the past six years, a majority of our campuses have taken advantage of deregulation's freedom of choice to create Telecommunication Departments, establish Director of Telecommunications positions, and develop communications operations that represent the fastest growing organization on the campus.

Organizational Generalizations

The last page of the survey instrument contained a request for a copy of the organizational chart for the campus department of telecommunications. The most challenging part of the data analysis has been drawing conclusions and making generalizations from these hundred or so charts. An indicator of the newness of telecommunications on our campuses is the fact that less than half provide a "printed" organizational chart. The others used the multi-purpose form provided and filled-in the blanks.

Next, it was necessary to separate the campuses into those with their own switch/PBX versus those served by Centrex (the local telephone company). Rather than comment on each observation, please note these generalizations.

As indicated earlier, the size of the campuses and in turn, the size of the telecom operation followed the often cited "bell shaped Curve." Given this diversity, the data falls into fairly neat groups. Thus, the following generalizations represent statements that you can bank on as being the norm.

Telecommunications Departments with Centrex Service

--Staff size ranged from 2 to 85 people (an average of 19)
--Span of Control averaged 3
--Staffs of 5 and larger had an average of 5 Operators
--20 and larger staffs also had an average of 5 Installers -
--Most department heads were "Director" Smaller ones were "Manager"
--75 were named "Department of Telecommunications"
--No consistency of technical titles
--Typical organization was "Business/Finance," "Customer Service," and "Installation & Maintenance"

Telecommunications Departments with its own Switch/PBX

--Small Departments -- Staff from 2 to 11
-Typically organized in 2 to 3 groups Operator, Accounting, & Technical
-Average of 2 Operators
-Director is called "Manager"

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--Medium-sized Departments -- Staff from 13 to 16
- -Span of Control was typically 3
- -Usually 3 or more Operators
- -Included Telecommunications Technicians (PBX caretakers)
- -Or PBX Maintenance was "Contracted out"
- -Operators Function aligned under Accounting/Billing
- -One or more Programmer Analysts present

--Large-scale Departments -- Staff from 19 to 25
- -Span of Control was typically 3
  Customer Service, Finance & Billing, and Plant/Facilities
- -Usually 5 or more Operators -
- -The PBX was of "Central Office" size -A full technical staff to include: cable plant, installation & maintenance, and switch operations
- -Often a "Data Communications" group -Department head was called "Director"

Since these two sets of summaries truly highlight observations concerning over 100 organizations, making a recap of them would be the height of redundancy. So, about the best thing that can be said here is that if one wanted more specific groupings of data it is available. In fact, all of the data groupings will be written-up and published next year.

CLOSING THOUGHTS

"What's new in telecommunications?" Campuses are growing their own mini-telephone companies. But more than that, they are tending to be more of a full-service offering than their counterparts "down town" (the local phone company). Universities have always done a better job in data communications and they will continue to push the technology frontier in this regard. Additionally, colleges and universities are and will continue growing in the delivery of student services such as: long-distance resale, cable TV, voice mail, alternate operator service, and the like. The sky is the limit!

And that, my friend, is **WHAT'S NEW IN TELECOMMUNICATIONS**

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FOOTNOTES

(1) Gene T. Sherron, "An Information Technology Manager's Guide to Campus Phone Operations," CAUSE Processional Paper #3, January 1990, pp. 26.

(2) Alan Simpson, "The State of the Optical Art,"Telephony, August 27, 1990, p. 40.

(3) Jerry FitzGerald, Business Data Communications, 3rd ed, (New York: John Wiley & Sons, 1990), p. 347.

(4) Gene T. Sherron, "ISDN--Take Another Look,"CAUSE/EFFECT, Summer 1990, pp. 3-4 and "The Scope of ISDN," Procomm, October 1990, pp. 41-42.

Computer to Computer Communications: When E-Mail is Not Enough

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Computers today function as information processors, not large calculators. Computing on desktops and in dorms, with world-wide campus network interconnections, permits communications on an unprecedented scale. But the most widely-available messaging tools will soon be inadequate to the task. Princeton University is investigating how computer-based messaging systems can cope with this flow of information and aid internal communications for strategic planning and consensus building. The paper reviews the history of these systems and mail distribution lists, examines the strengths and weaknesses of each, and outlines the roles that personal computers and centralized computing resources can play in meeting this need.

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When the history of the computer revolution is written, two images will be recalled: the room-sized ENIAC that ushered in the age of computers and the thumb-nail sized microprocessor chip that brought computing to office and home desktops. Accompanying this miniaturization in size, and growth in power has been an equally dramatic shift in function. Whereas the ENIAC's function was numeric processing and calculation, the microchip's main application is in the areas of word and information processing.

The application of computers to the communication of information, or computer mediated communications systems (CMCS), began in the 1970's. As computing applications have shifted increasingly towards information rather than strictly numeric processing, the potential for CMCS use has grown. Second-order effects of the personal computer revolution are now appearing. Users who took to the personal computer for word processing and spreadsheets now look for ways to organize, share, and communicate their ideas and work with others. Industry pundits have coined a new buzzword, "groupware," for this as yet vaguely-described but nonetheless highly-desired capability.

Princeton University, along with many other universities, has experienced these changes. Whereas once users trekked off to a computing center to punch cards or sit at hard-wired terminals to "do computing," today we see first year students, computers in tow, setting up their own computer centers in their dormitories. From their rooms, students can write papers, work on lab reports, run simulations, as well as connect to information resources on the campus internet and beyond. Faculty and staff now make use of desk-top and departmental computing resources for a host of critical functions, from basic research and experimentation to managing grants and departmental finances.

Users are increasingly aware of the role of the local campus network, along with the regional and national networks that interconnect it with other campuses, as a conduit of information and vehicle for communication and collaboration. Use of electronic mail for local and remote communications is growing, university purchasing and financial on-line information systems are now routinely accessed by departments, and regular transfers and sharing of information between local and centralized networked computers is becoming commonplace.

With a campus backbone network and localized computing infrastructure in place, Princeton has begun to look at how internal communication, discussions, consensus building, and information dissemination might be assisted through the use of networking and computer resources. An *ad hoc* committee has been set up within Computing and Information Technology to explore the current state of computer mediated communications systems as they might apply to fulfilling these perceived needs of the university community. The groups has just begun its evaluation of several systems, and is hoping to have preliminary recommendations ready by early 1991.

CMCS's: A Brief History

Computer mediated communications systems began in the early 1970's. Pioneering efforts included SRI's Augmented Knowledge Workshop (AKW), the Institute for the Future (IFF)'s PLANET, and several commercial systems like the Computer Development Corporation (CDC)'s PLATO NOTES system and Scientific Time Sharing Corporation (STSC)'s MAILBOX.[1]

[1]John S. Quarterman, The Matrix: Computer Networks and Conferencing Systems Worldwide (New Bedford: Digital Press, 1990) p. 158.

The first important practical use of a CMCS was EMISARI (the Emergency Management Information System and Reference Index) developed by Murray Turoff for the U.S. Office of Emergency Preparedness under the Nixon administration in 1971. This system allowed the government to monitor wages and prices around the country, rapidly disseminate wage and price freezes to regional offices, and electronically discuss issues related to economic policy.[2]

EMISARI formed the basis for the Electronic Information Exchange System (EIES) that Turoff went on to develop at the New Jersey Institute of Technology. The system originally ran on a Perkin Elmer mini-computer located at NJIT, and was made available nationwide through EDUCOM's EDUNET, an educational resource-sharing network using public data networks for remote access. Educational and research organizations and individuals made effective use of the system for everything from distance learning and distributed collaboration to work by industry standards bodies.

The EIES system proved to be a rich development environment for other CMCS's. Participate was prototyped on the EIES system, using its powerful INTERACT programming and development environment, by C. H. "Harry" Stevens. It was later made available on the commercial information utility, The Source, and also as a stand-alone system for use locally by organization on their own computers. Its features included a very rich branching structure for its conferences.

At Wayne State University, CONFER was designed by Dr. Robert Parnes in 1975. It is now widely used at the University of Michigan where it has grown to become an integral part of the university experience for many of the students, staff, and faculty as a forum for discussion and information. Development of a unix port of CONFER is under way, but it currently only runs under the MTS (Michigan Timesharing System) mainframe operating system.

In 1977, at the University of Stockholm's QZ Computing Centre, Jacob Palme created the COM system, a powerful messaging and conferencing system that has been used in that country and internationally for university and commercial applications. Originally designed to run on DECsystem 10/20 computers, COM was rewritten in a portable version called PortaCOM to run on a variety of operating systems.

Caucus was developed by Charles Roth as a very portable conferencing system modeled largely on the Confer system. It runs on a wide range of machines from small PC's to mainframes and powerful unix servers. The user interface is dictionary-driven making foreign language adaptations of the system easy to implement.

At the University of Guelph, Alastair Mayer worked on the CoSy system in 1983. The resulting system was used extensively there and later adapted for use in BYTE Computer's on-line BIX system. It is now a commercially marketed product running on unix and other machines.

Mailing Distribution Lists and CMCS

About the same time these CMCS's were under development, the United States Department of Defence's Advanced Research Projects Agency (ARPA, now called DARPA) was experimenting with a wide-area data communications network. Computers at universities and military sites were connected to what became the ARPANET. Electronic mail systems on each computer allowed researchers to address messages to colleagues at any of the other interconnected computer systems.

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[2]Brock N. Meeks, "An Overview of Conferencing Systems," BYTE, December 1985, p.169.

They did not need to login to the colleague's computer, and thus did not need to request an account or learn how to use the remote system in order to communicate with users there. Electronic mail soon became a dominant use of the network, more so than the originally-expected services such as remote login.

Most electronic mail systems allow users to create personalized lists of frequently-addressed recipients that can be called up instead of having to type in the individual addresses. A CMCS-like "mailing distribution list" facility can be set up by centralizing these lists of addresses. Researchers who wish to keep each other informed of their work can create a centralized list to which all the members direct relevant mail. Users send mail to an address that looks like a userid at the list-maintaining host computer (e.g. "fusion-list@ppl.princeton.edu"). When the host receives the mail it "explodes" it out to each of the remote recipients on that particular list.

Today's descendant of the ARPANET, the Internet, consists of interconnected networks, such as the National Science Foundation sponsored NSFNET and its member networks, which use the Transmission Control Protocol and Internet Protocols (TCP/IP). Electronic mail, much of it from such mailing distribution lists, remains an active part of the network. Some 250 lists are widely advertised on the Internet, and many more private ones exist. Some are technical, like the "unix-wizzards" list that dates back to 1977. Other topics range from the practical (a recipies list) to the frivolous (a science fiction lovers list). Interconnections with BITNET and UUCP networks (see below) provide access to similar facilities on those networks.

In 1985, the author, then director of the BITNET Network Information Center (BITNIC), and Ira Fuchs, who headed the BITNET Development and Operations Center (BITDOC), proposed a mechanism for adding mailing list capabilities to BITNET. The resulting software, LISTSERV, was developed by Ricardo Hernandez, and distributed to several dozen BITNET sites. Its success was such that LISTSERV traffic soon began to swamp the more congested BITNET links. In response, a revised LISTSERV was created by Eric Thomas of the Ecole Centrale de Paris in France. Whereas the initial LISTSERV used a simple mail "exploder" (one in, many out) mechanism, Thomas's improved version made use of a set of peer LISTSERV computers, which communicated among each other to more efficiently distribute the traffic. A message going from the US to several dozen users in France, for example, would transit the Atlantic once, and be "exploded" only after arriving at a French peer LISTSERV. Thomas's version also added features such as automated list signup and retrieval of archived postings, information files, and programs. The combined BITNET/NetNorth/-EARN networks on which LISTSERV operates have nearly 1,700 lists world-wide in active use today.

These network-based "distribution list" systems developed in parallel with centralized CMCS systems. Functionally, both types of systems provide for one-to-many (and by extension many-to-many) communications. CMCS's provide specialized tools and facilities to deal with this sort of communication. Distribution lists, on the other hand, are handled by programs designed primarily for electronic mail, which is predominantly one-to-one communications.

Both provide the ability for users at different, and often geographically dispersed, locations to form groups based on common interests. CMCS's usually require remote access to a centralized CMCS. Mailing distribution lists allow users to do this within a familiar environment (their local computing environment) using the same tools (electronic mail) used to support communication with individuals at their own or other universities.

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Because of its simplicity of installation and setup, mailing lists usage has grown dramatically, especially as the penetration of networks has grown to virtually all the major institutions of higher education. An individual or group wishing to set up a mailing lists need only set up the mailing address that will do the mail exploding. As stand-alone multi-user workstations have dropped in price, it is now possible for individuals to do this. In other cases, the administrator of a centralized mainframe or mini-computer needs to be involved. Setting up such lists (using LISTSERV or other mailing distribution list exploders) is relatively straight forward.

Publicizing a mailing distribution list involves advertising the network addresses for list signup and postings. After signing up, users continue to use the standard mail interface to send, receive, or reply to items posted to the mailing list. As a result, list members are instantly connected to a set of colleagues with similar interests .

Many of the advantages of mailing distribution lists contribute to their disadvantages as a means of group communications. Since most subscribers use their standard mail systems to read and organize mail that comes from lists, they often do not have tools to deal with the volume of information that can come from lists. Sorting, searching, and following threads can be difficult, especially when the volume of messages is large. Cross postings to several lists show up multiple times in the mail system. Worst of all, one's personal and often urgent mail can get intermixed and buried in distribution list mail. In addition, since mail is sent to each subscriber's mailbox, multiple copies of the list mail items often exist on a campus or even on a single machine.

Hybrid Systems

There are several examples of systems that have the characteristics of both a conferencing system and a mailing distribution list. These systems work in a distributed fashion among a number of geographically dispersed computers, but provide local access and a single common local copy of the information for users at each site.

In UUCP, a facility for posting information to interest groups, called netnews, functions similarly to a mailing distribution list. Users post items to netnews groups, instead of to a distribution list. When an item or message is posted to a "newsgroup," however, the netnews mechanism employs a flooding algorithm to distribute the item to other sites that have indicated an interest in (subscribed to) that particular newsgroup. New items thus transit the network until each subscriber site has received it[3].

Thus, on a machine-specific basis, it is decided whether or not users of that computer will have access to certain netnews groups. For each group, there is also an associated expiration period. Articles only remain on the system for users to read for the duration of that time period, and are then removed. If a specific department (or user with a netnews-capable machine) wishes, they in turn can subscribe to a group, and then keep the items for a longer expiration time.

Netnews reader programs provide tools for viewing these posting, and in some cases provide end-user functionality approaching that of a conferencing system. In all cases, the netnews items are not a part of the user's personal mail, and pointers, rather than individual copies of each messages, keep track of what groups a user is following and which items are read and unread.

[3]Mark R. Horton, Standard for Interchange of USENET Messages, issued as Request for Comments (RFC) 850, DDN Network Information Center, June 1983.

An implementations of netnews for the IBM VM/CMS operating system, developed by Irwin Tillman at Princeton University, provided both a netnews reader for the end user as well as a mechanism for receiving and sending netnews postings. Tillman also made it possible for LISTSERV lists to be posted to netnews. This allowed users of LISTSERV distribution lists, whose personal electronic mail boxes had become inundated by LISTSERV mailing list items, to monitor the lists through netnews.

EIES2, the current implementation of the EIES system, has been designed to operate within a distributed environment as well. Its so-called User and Group Agents can run within the same physical computer or the User Agent can interact with a remote Group Agent on another computer, which in turn can interact with other Group Agents over TCP/IP or X.25 (international public data network standard) networks.

At IBM, two researchers, Robert Flavin and Jack Williford, developed an internal distributed conferencing system called GRAND (its predecessor was called PALTRY). The system was built to be distributed, and have a highly tailorable user front end.[4] Like netnews and EIES2, GRAND is a distributed system, and provides a means for cooperating GRAND systems to keep each other informed of new articles submitted to a local system. The GRAND system was based on IBM's Network Job Entry /Remote Spooling Communications Subsystem (NJE/RSCS), the same protocol that underlies BITNET host to host communications.

GRAND allowed several "notification styles" for end users that ranged from an interface to local or remote copies of GRAND conference entries, to delivery of items as personal mail. GRAND thus functioned as both a mailing distribution list exploder as well as a conferencing system.

PortaCOM, a portable implementation of the COM conferencing system, has a Network InterfaCE (NICE) that allows it to both send and receive mail from external mail systems. In this way, external mailing distribution lists can be directed to a PortaCOM conferences, or users can have items from lists sent to their own mailbox. PortaCOM attempts to minimize duplication of items by attaching unique identifiers to each message handled by the system. PortaCOM conferences can also have external "members," so that remote users or mailing distribution lists can participate in PortaCOM conferences.

Role of Personal Workstations in CMCS

The dominant model of a CMCS is a central computer on which the data and user profiles reside. Users are required to login to interact with the system. This style of time-shared computing predominated when most computer conferencing systems were developed, and most systems have retained this model. Users of such systems were often limited to printing or simple video terminals at slow (300 bits per second) speeds. The user-interfaces and text editors available had to conform to, or at least take into account, such a user environment.

Many CMCS's use menus that constantly repeat the choices (some video terminals had only 24 lines that scrolled irretrievably off the screen), or command interfaces that require users to remember (or call up a menu first) and then type to navigate around the conferencing system. Editors in most CMCS's are the line-oriented style of editor associated with printing terminals that require users to

[4]Robert A. Flavin and Jack D. Williford, "The Network Application Manager," BYTE, December 1985, p.203.

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memorize commands for changing text, inserting text, etc. Reflowing of text (adjusting line lengths after text insertions and deletions) can be difficult if possible at all.

As long as this was the only way to access computing, such interfaces were at best tolerable. Since users had to access centralized computers for other applications (such as statistical analysis, on-line administrative systems, etc.) they needed to become familiar with some of the access procedures and editors anyway. The learning curve for the systems, while steep, was at least useful for other computing activities. Today however, most users have access to personal computers that provide far more flexible editing environments and user interfaces. On many, bitmap graphics and mouse-driven menus provide a far more intuitive means to access programs and data.

Some CMC's developed ways to make use of the growing power and intelligence of personal computers that were beginning to be used as terminals to access these systems. On the EIES system, a program was written for the AppleII that attempted to locally mimic the EIES system, and then build a set of batched commands that could in turn be executed on the EIES system. The results were then returned for local perusal on the microcomputer. This was viewed both as a cost-saver (since both system and telecommunications costs were time-based) and an aid to the user (since some of the features of the local micro, its editors, etc. could be used in preparing the text to be submitted, as well as in processing it later.)

A later version of EIES called TEIES (Tailorable EIES) allowed personal computers to locally create items for use in the system, including pictures, graphics, and formatted text[5]. Other "Personal-TEIES" users could then view these items, or create their own for submission to the TEIES system. Access and navigation was accomplished through PF-keys on the PC. The PortaCOM system has both a Macintosh (MacKOM) and PC (VIDAKOM) interface to its system that provides a localized environment in which to interact with PortaCOM.

Another approach, taken by the University of Michigan's InfoDisk, is to build a front end to host systems that in turn communicate with a remote workstations using a defined protocol. In Michigan's case, mail and a calendar of events were front-ended with a MacWorkstation program that translated system commands and structures into pull-down menus and "dialog boxes" on a Macintosh. The complexity of the system was masked behind a series of menus and fill-in boxes that allow the user to intuitively explore and make use of the power of the system. To the end user, the system appeared like a Macintosh application running locally.

In each of these systems, the user is able to use a local word processor to prepare text for submission to the system. Some of the interfaces include their own WYSIWYG ("What You See Is What You Get") editors, or are integrated with existing text editors. Windowed personal computer environments (such as Microsoft Windows on PC's, the Macintosh interface, or X-Windows on unix workstations), with "cut and paste" capability can simplify the use of systems even with simple "dumb-terminal" interfaces.

A local front-end to a CMCS allows a logical split of responsibility. The centralized computer does what it does best, centrally store and manage the data of the conferences as well as the information about the participants. The user's personal computer does what it does best, provide a better, more

[5]Starr Roxanne Hiltz and Murray Turoff, "Teaching Computers and Society in a Virtual Classroom[TM]," Proceedings of the Conference on Computers and the Quality of Life, Association for Computing Machinery SIGCAS, Volume 20, Number 3, October, 1990, p. 70.

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intuitive interface to the system and permit the use of local familiar tools, such as editors and spell-checkers.

Another way to divide responsibility between the central computer and the workstation is through a client-server model. The user's personal computer or workstation is the client or user of a set of services, and the central computer is the provider or server for the set of services. In a true client-server model, the functions and the split of responsibility are well-defined and incorporated into the client-server interface and protocol. An abstract model for a set of client-server functions can form the basis for a standard that operates independently of the implementations of the client and server.[6] Some of the first adaptations of personal computers and workstations to computer conferencing systems were merely grafted on to existing terminal-based applications. Thus there was not a redesign of the interface and protocol, but rather an attempt to develop an interface based on the existing computer-terminal interface.

The GILT project[7] was a multi-year effort at defining a protocol for communications between large centralized computerized conferencing systems. Conceptually, a number of conferencing systems, each with a localized set of users, would transfer information among themselves, and provide the appearance, of a single conferencing system spanning all the systems hat were participating. Funding for the project ended before it was implemented, however.

Netnews, as described earlier, normally employs a flooding algorithm to pass along locally-submitted news group items to other netnews sites. Delivery is deterministic, with sites accepting whatever "new" items have been submitted to groups they subscribe to. A variation on this is the Network Netnews Transfer Protocol (NNTP)[8]. This provides a mechanism for sites to request items in specific newsgroups (based on as the dates of their submission, or message id numbers, etc.). Sites can thus take a more active role in accessing netnews items. It also means that a site can decide to keep a much more limited (recent) local "store" of netnews items (based on the most frequently or likely to be accessed items). If a user requests an unavailable item, the system can use the NNTP protocol to retrieve it from some centralized (perhaps even remote) system with a larger archival store of items.

While envisioned as a protocol for communications among larger multi-users netnews machines, NNTP can also be used with personal computers or workstations to access netnews articles. For unix workstations, the windowing protocol called X-Window provides a graphical interface that allows mouse-driven cutting and pasting, as well as button and pull-down menu access to applications. An X-Window interface to netnews, called xrn, allows users to view, sort, and access newsgroup lists, subject headings, and posted articles in netnews. Powerful system features, such as subject or text searching, following and leaving discussion subject threads, and submitting follow-up items can be done with just the click of a mouse.

Several NNTP-based netnews readers exist for the Macintosh. As with xrn, the user is presented with a visual interface to the lists of groups, subject headings, and contents of the newsgroups that makes it easy to navigate and manipulate the items in the groups.

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[6]Jacob Palme, "Conferencing Standards," BYTE, December 1985, p. 197.

[7]GILT-Interconnection of Computer Based Message and Conference Systems, Green Version, (Duesseldorf: University of Duesseldorf Computing Center, Universitätsstrasse 1, 1983).

[8]Brian Kantor and Phil Lapsley, Network News Transfer Protocol, issued as Request for Comments (RFC) 977, DDN Network Information Center, February, 1986.

In both cases, the user's computer acts as an NNTP agent (client) accessing information from an NNTP server via the protocol. Because of the way the protocol operates, it is possible to have a number of different user implementations (interfaces) for netnews. The protocol deals strictly with the requests for information about items, and not with how the items are presented to or how information is requested of the user.

Evaluation of CMCS

Early reviews of CMCS's attempted to create a framework for evaluation of these systems. Among the items considered were design features, user acceptance determinants, and impacts on the users and groups. While there was disagreement about the relative importance of many of the specific features of CMCS's, there was agreement among systems designers that accessibility, humanization, responsiveness, and text-editing capabilities were extremely important.[9] In a subsequent study of productivity enhancement from CMCS's, system acceptance was seen as largely determined by external factors, such as initial user expectations. A combination of factors, including group, individual, and task characteristics, combine with the particular system software to produce (or not) a gain in productivity.[10] While these studies have provided a good theoretical framework for evaluation, they have not produced any definitive recommendations.

The *ad hoc* evaluation committee at Princeton set a number of criteria for its investigation of a CMCS. Ease of use for first time users, from navigating in the system and following discussion threads to inputting information, was viewed as extremely important. The groups felt it was important that the system be able to interact well with existing mail systems for both on and off-campus electronic mail. Searching and archival/retrieval capabilities were felt to be important as the system and its contents grew. Of lesser importance were the exact feature set (beyond those functions mentioned above), administrative and maintenance issues, and direct interaction with other conferencing systems.

Several base criteria were established for the first set of evaluations. Any system without a responsiveness comparable to the current mail systems would not be acceptable. Since it is anticipated that one of the first uses of the system will be as a tool for strategic planning and discussions, the system must support private or close conferences. The initial platform considered for the system was a SUN SPARC-based machine running the unix operating system. This avoided concerns about load on an existing and increasingly administratively-oriented VM/CMS system, allowed testing of the system on a small, locally administered SPARC workstation, and provided the potential for moving the software to a recently-acquired more powerful SPARC-based compute server.

After an initial investigation of a number of systems, three were chosen for further use and evaluation by the evaluation committee. Face-to-face meetings and the CMCS's themselves are to be used in evaluating the systems and further refining evaluation criteria as the group proceeds. Several individuals outside Computing and Information Technology will be brought in to the evaluation process after an initial several weeks and feedback on each of the systems.

The CMCS's

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[9]Elaine B. Kerr and Starr Roxanne Hiltz, Computer-Mediated Communications Systems. New York: Academic Press,1982.

[10]Starr Roxanne Hiltz, "Productivity Enhancements From Computer-Mediated Communications: A Systems Contingency Approach." Communications of the ACM, December 1988, p. 1438.

EIES2	EIES2 is a rich, full-featured conferencing system whose interface makes some use of a VT-100 (cursor-addressable) full screen for command selection and explanation, using a Lotus123-like menu interface. The system editor is still line oriented, although some on-screen help is provided. It is possible to interact directly with the underlying unix operating system and move files, mail, etc. in and and out of EIES2 with unix-style command. An X-Windows-based interface is under development. EIES2 permits the addition of personal key words to items, provides for following conversational threads and backward-chaining for earlier items. Because of its design, the system is extremely flexible and tailorable, although programming effort would be required for system changes.
PortaCOM	Development and marketing of PortaCOM has been taken over by a spin-off group from the University of Stockholm called KOMunity. PortaCOM is a feature-rich conferencing system with well-developed tools for integrating external mail and distribution lists (both sending and receiving) into its structure. It also has powerful organizing and threading capabilities. It features both a command- and menu-based interface. A "friendly" iconic Macintosh (MacKOM) and PC-based pop-up menu front-end (VIDAKOM) are available for asynchronous connections.
Caucus	Caucus appears to be the most scaleable of the true conferencing systems. It runs efficiently on everything from a 80286-based unix personal computer to a SUN SPARC server. Several types of interfaces (abbreviated menus, full menus, and commands) provide flexibility. The system does not directly make use of full-screen terminals, although the use of any unix-based editor (including full-screen) is easily supported. With a scrollable cut and paste terminal windowing system, the system is more useable. Following newly entered conference items and responses is easy. Finding new responses to items previously read is not as intuitive, nor is back-chaining. Conferences must be explicitly entered (and then left to enter a new conference) to find awaiting new items.

The task force is hoping to find a CMCS that adequately meets the criteria outlined earlier, and to begin to use it with a controlled test group before releasing it to administrative policy makers and to the community as a whole. We have been encouraged by developments in local personal workstation front-ends and front-end tools which can facilitate usage of these systems. We are investigating both system-specific as well as more generic abstract-model based interfaces to work with these systems. CMCS access is viewed as part of a more general goal of providing universal and seamless access to all computing resources from any platform supported on campus.

The introduction of a CMCS has the potential to have high a visibility payoff for the university computing infrastructure. Initial rejection of the system on the other hand could set back general acceptance of such a tool. It is important therefore, that the system, its interface, and its introduction to the community all be appropriate to its intended tasks and users.

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Marketing Principles Extended: Creating a Statewide Network

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The prognosticators were right! Campuses moved from islands of computing (centralized computing with star networks) to distributed computing resources. And then, the whole bunch wanted to get back together again as a network. This sequence of events has occurred on numerous campuses including the University of Arkansas. We created our University network, UARKnet, and connected to the outside world by BITNET and NSFNET. Subsequently, we discovered that we could communicate almost anywhere but within our own State! So, we did the logical thing, we decided to create a statewide higher education network in Arkansas, ARKnet!

In the summer of 1989, we started the marketing effort by recruiting computing services directors from within the University of Arkansas System to be our partners. We soon found that the marketing effort could not succeed by emphasizing the elegance of the technology. We decided ARKnet had to be done without requiring new dollars, had to add significant value to the resources of each campus, and had to include all participants as "first-class" members. Now we have formed a confederation of 19 institutions and submitted a proposal to fund ARKnet to the National Science Foundation (NSF). About half of the schools have decided to form the network core with or without NSF support because it "has to be done." In order to share the financial load, partner networks for ARKnet have been found in the research community, university extension services, and State government offices. By applying marketing principles to a network development project, we have come up with a winner! This presentation provides the details.

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Marketing Principles Extended: Creating a Statewide Network

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The University of Arkansas is an example of the classic model of a university. It is the State's flagship university, located in a small city, and isolated by the Ozark Mountains from the rest of the State. Our university is like many others—short on cash and long on opportunities for change through technology. Almost everyone is familiar with the Razorbacks' athletic programs. They are awesome! One of our objectives is to have an academic program that is a source of pride for the athletic program!

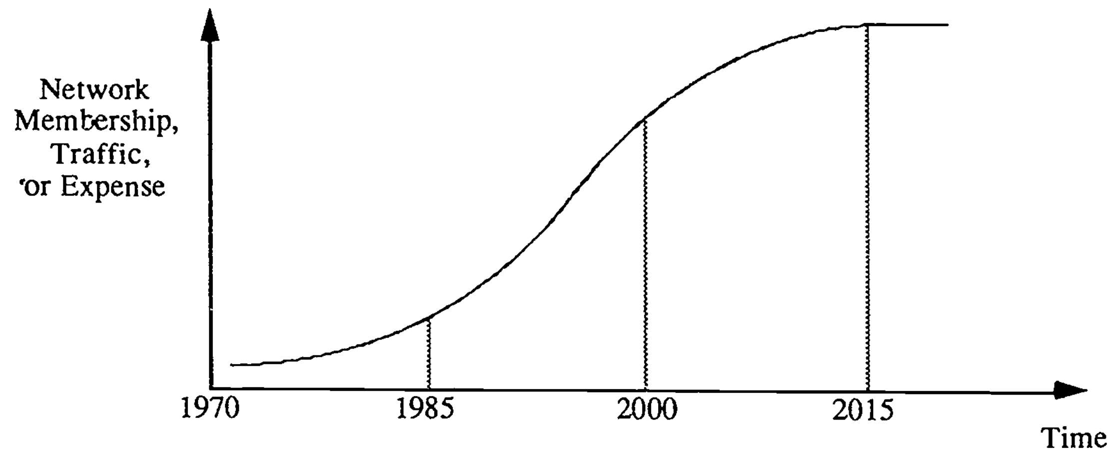
Several years ago, Computing Services did a painfully honest appraisal of the quality of resources offered to our clients for academic, research, and administrative applications. We really did not have much to offer, and the computer users were telling us that in numerous ways. In earlier presentations at CAUSE (Zimmerman, 1988; Statham, 1989), and in other forums, we have reported dramatic changes that occurred as a result of redirecting resources, establishing partnerships, and marketing services. In short, we installed a high-speed computer network throughout the campus and upgraded mainframe, minicomputer, and microcomputer platforms. More and better computer resources will always be needed, but we are approaching the ability to deliver appropriate resources to the site of a client's choice.

Academic and administrative computer users responded to the enhanced facilities with enthusiasm and requests for more. Use of facilities increased dramatically for computing and communications on our campus and across the nation via the Internet. There was one significant area within the United States though where we could not share resources—Arkansas! The University of Arkansas was the only National Science Foundation Network (NSFNET) connection in the State. We were isolated from the rest of Arkansas, and the rest of the State was isolated from the nation! Computing Services' managers discussed the in-state communications void, and among solutions proposed, we found an "ace that we could play." We decided to extend MIDnet, our NSFNET regional network, into Arkansas and named that project MIDARK.

Now, that might have been just a little presumptuous! We had a few barriers that we would have to get over to create a statewide network. No funding was available for the MIDARK Project. A few months earlier, University Chancellor Ferritor had told the Director of Computing Services that a statewide network was a low priority project. Other universities in Arkansas did not have campus networks and were generally not interested in a statewide network. If the other campuses had been interested in a statewide network, most would have preferred to work with almost anyone but our university! In fact, there were few examples of successful cooperative projects of any kind among universities in Arkansas! Did such a project have any chance of success? Can elephants fly? We decided to go for the MIDARK Project, and Computing Services' representatives began discussing statewide networks in informal contacts with other universities in Fall 1988. After a year of these low-profile, low-interest, and low-awareness activities, we had made little noticeable progress toward our objective. We decided to escalate our efforts and formalized our MIDARK Project to get the job done.

In order to take advantage of the work of others, our first step in getting the job done was research. We found one paradigm, shown in Figure 1, at a Coalition for Networked Information (CNI) Task Force meeting. Our MIDARK Project evolved from NSFNET, the precursor of the National Research and Education Network (NREN), and its growth fit the growth pattern projected for NREN, as a lag variable. The first stage of the paradigm was initiation

which required an entrepreneurial style of management. For MIDARK, the interest and awareness activities of the first year represented that stage. Although the first year's accomplishments of MIDARK had been modest, we had found interested researchers, school districts, universities, and State or University agencies. Unfortunately, most had little if any money for statewide networking. Fortunately, Computing Services had been able to get authorization to reach out into Arkansas with a T1 connection to Little Rock. With or without partners outside the University, we made a commitment to extend our network based on only University of Arkansas needs.



STAGE	INITIATION	GROWTH	CONTROL	MATURITY
Management Style Required	Entrepreneurial	Marketing	Utility	Full Service

Figure 1. Predicting NREN Growth (Hall, 1990)

Funding the extension of UARKnet, the University of Arkansas campus network, into the middle of the State took a little creative financing and negotiation, but we got the "green light." Now, if we could get the participation of the interested parties found in stage one, the initiation period, with accompanying funding sources, we could propel MIDARK into stage two, the growth period. A "marketing" style was needed for the growth stage so we looked to marketing literature to develop appropriate strategies.

Those of you who may have had exposure to marketing concepts in the past may remember the "Four Ps": Product, Place, Price, and Promotion. In the last decade, however, marketing management has taken a new twist, emphasizing the customer or client (Neidell, 1983, p. 4). Today's marketing strategies are characterized by:

- Well-defined processes rather than random acts.
- Management process of analysis, planning, product/service development, and controlled delivery.
- Packaging products/services for targeted clients.
- Designing products for market needs/wants.

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Although we now had an understanding of the modern definition of marketing, there was still some reluctance to become "sales persons," particularly considering all of the exposure each of us has had to such individuals. A little more research provided a ready answer to the question, "Why marketing now and not before?"

Many of us who have been in information technology for a number of years recognize the proliferation of the microcomputer as the starting point for having to take a new look at how we performed our day-to-day activities. While the microcomputer had a revolutionary effect on the options available to the users of information technology, larger changes were taking place in the work place which dictated a new approach for the whole service sector of our economy. Figure 2 shows the growth of the service sector in terms of United States employment since 1920. The number of people employed in the production and distribution of services has been steadily increasing since the turn of the century. Furthermore, the growth in this sector during the past 20 years has been greater than the total growth for the forty years prior to that time. Obviously, such growth should result in changes in the way we do business, and the new recognition of the role of marketing could be considered a natural change. It has been said that the recent recognition of the discipline of services marketing can be explained by the fact that marketing was not needed when "demand exceed supply and competitive pressures were few" (Bateson, 1989, p. 4). This concept describes us service providers in the field of information technology perfectly. It also answered our question.

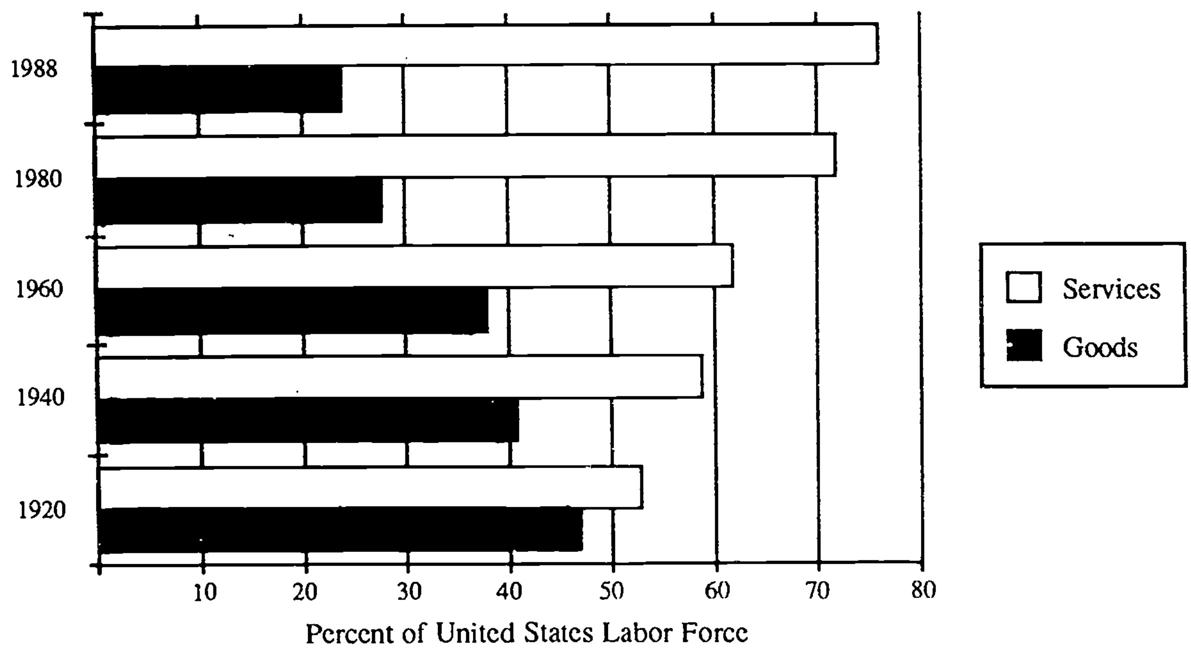

Figure 2. Growth of the United States Service Sector (Adapted from Bateson, 1989, p. 25)

Now that we appreciated the need for marketing, the next step was to find a workable model to assist us in organizing our process. Although many, often complex, models can be found in the literature, we settled on the relatively simple "Five-Stage Model for the Consumer Buying Process" shown in Figure 3. As a well-known expert in the field of marketing, Philip Kotler was telling us to put ourselves in the shoes of those on our target campuses who would be making the necessary decisions. He further helped us by defining the consumer as "the person or organization that is the target of the marketing effort" (Kotler and Fox, 1985, p. 197).

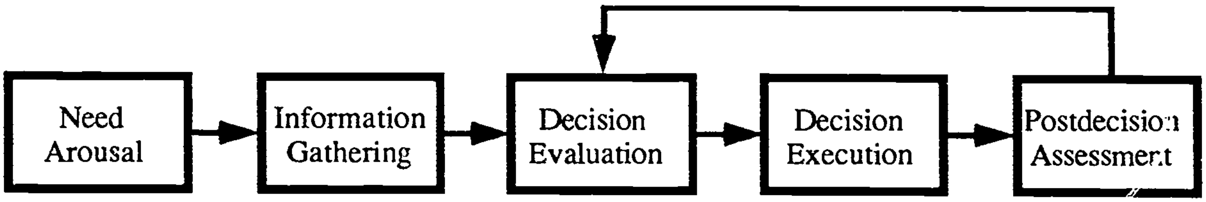

Figure 3. Five-Stage Model of the Consumer Buying Process (Kotler and Fox, 1985, p. 198)

As the marketer works his or her way through the model, the following questions must be answered:

1. What needs and wants give rise [to the consumer] to the interest in buying or consuming the program or product?
2. What does the consumer do to gather information relevant to the felt need?
3. How does the consumer evaluate the decision alternatives?
4. How does the consumer carry out the purchase?
5. How does the consumer's postpurchase experience with the program or product affect his or her subsequent attitude and behavior toward it? (Kotler and Fox, 1985, p. 198)

Since we were viewing the model as "marketers" who wanted to get our "consumers" (Arkansas's colleges and universities) involved in our "program or product" (developing a statewide network), we decided it would be easier to modify the model slightly to reflect the marketer perspective. Our result is shown in Figure 4. We needed to get the attention of Arkansas's colleges and universities so that we could educate them as to the need for access to national and international networks. Then we needed them to make a positive decision to join with us to create a statewide academic/research network. After they decided to work with us, we had to obtain the necessary funding so that we could implement the network. Finally, we would then need to evaluate the results to see if we needed to add new partners to our working group (confederation).

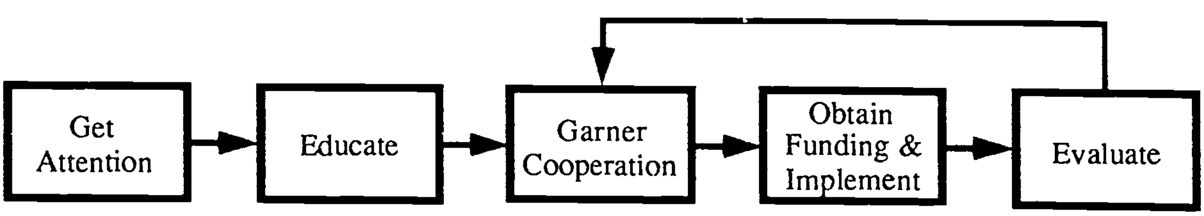

Figure 4. Modified Five-Stage Model

For our model to work, we had to have a full understanding of our potential clients. According to the experts, in order to arouse the consumer's need, the marketer must know the consumer well enough to know how to trigger his or her interest while reducing his or her feelings of risk. During the "education" stage in particular, the consumer must view the information source as creditable, yet he or she generally does not want to exert significant effort to obtain the information necessary to make the decision (Kotler and Fox, 1985, p. 211). Since our clients were also educational institutions, we were aware of some basic characteristics. An

especially important consideration was the fact that many of our potential clients had had previous relationships with the University of Arkansas. Based on these experiences, our consumers desired autonomy, felt competitive (e.g., Who always got the biggest share of State appropriations?), and were suspicious of our intentions. In addition, most were not familiar with network concepts and funding was scarce everywhere.

In order to get commitments to participate in a statewide networking effort, we were also going to have to be sensitive to the organizational structures of our potential clients. As you know, one generally does not get fast decisions in a highly bureaucratic environment where institutional governance is the watch word. Mix in a few political concerns and the acknowledged competition among institutions, and a decision could take years. We decided that funding was going to be a key issue if we were going to succeed. We would have to offer a "no cost" means of participation. When we looked at potential funding mechanisms, we realized that state appropriations would take several years to obtain due to Arkansas's budgetary cycle. Although federal funds and endowments were a possibility, we did not have ready access to the right resources to make these a reality. We finally decided that a grant would be the most accessible source of funding, and we started pursuing possible granting agencies. You can probably imagine our enthusiastic response to the NSFNET Program, "Connections to NSFNET," announced in February 1990, that allowed NSFNET to fund connections for institutions whose mission was primarily undergraduate instruction. We finally felt that we knew enough to begin to pull the whole project together.

Having sized-up our potential clients and potential strategies, we started our marketing blitz with a free seminar. We followed this with on-site visits, attendance or presentations at professional meetings, and letters to potential decision makers inviting them to more free seminars. You know—all of the strategies that we see vendors using on us! We were even devious enough to have our Vice Chancellor for Academic Affairs invite all of his peers to attend a free seminar *with* their computing center directors. Our first exposure to using the media took the form of articles in various newsletters. A natural start was our own Computing Services' newsletter, *ARKive*. Then we were able to take advantage of one of our faculty member's involvement in the Arkansas Society for Computer and Information Technology (ASCIT). This allowed us to get coverage in the *Arkansas Computer Bulletin*, a statewide newsletter. Our first opportunity for national exposure came in the form of an article in CAUSE's *Manage IT* newsletter. We eventually promoted media opportunities successfully enough to attain coverage on many of the major television stations and daily newspapers throughout Arkansas. We knew we finally had a success when the telephone started ringing off the hook with questions about "ARKnet." Before long, we even needed our own brochure!

Our marketing strategies included use of "pitches" developed to enlist client support. We adopted a slogan from an area shoe store's commercials and announced that we could "save you more than you pay" with a statewide network. We tried to work in an open atmosphere that was inclusive instead of exclusive. After a few meetings, our peer institutions recognized that we were *really* talking about a cooperative partnership that could improve productivity at each of our partner schools. We were finally able to lure 18 of Arkansas's 32 institutions of higher education to participate with us in the ARKnet Confederation and to develop a joint funding proposal for NSF.

Although we were hoping for external funding for ARKnet, we knew first hand that there would also be real costs associated with each school's participation. We also needed to be prepared to support the network after external funding expired. Based on our own experiences, we were able to document several areas where savings could be generated in order to be able to redirect funds into supporting ARKnet. Most of our participants intuitively accepted savings related to inter-library loan and communications but were skeptical of savings that might be available through a software distribution plan or through group purchase agreements.

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Fortunately, one of the participating universities had already explored DEC's Campus-wide Software License Grant (CSLG) Program offered under the DEC Education Initiative and was willing to report directly to the confederation. Another university was able to attest to the group that real dollar savings were available through confederation purchase agreements. Finally, resource sharing meant that a campus' resources, whether equipment or expertise, could be expanded without actual dollar outlays.

As mentioned earlier, one of our pitches was that productivity improvements could be realized at each participating school. Most of these improvements would be based on the idea of resource sharing. Consulting services would provide valuable expertise in a timely manner through electronic mail and other forums. Although we were proposing an electronic network, a valuable by-product was the "people" network that developed first. Even our confederation meetings became an excellent mechanism for sharing knowledge. Although participants may have first considered consulting services to have come primarily from the University of Arkansas's networking expertise, it became apparent almost from the start that other campuses had valuable experience with products and architectures not available at the University. This reinforced the idea that we were really peer institutions. Training took on a similar complexion. Although the University would be providing the bulk of the training related to national connectivity, other institutions had valuable experiences that could be used to extend computing knowledge in Arkansas.

Technology sharing was a special area where productivity enhancements could be realized. Several schools in the State were in the formative stages of planning major hardware and/or software acquisitions. Many of the resources under consideration were already available elsewhere in the State. ARKnet could provide a mechanism for checking out these resources without having to invest significant scarce dollars in site visits. On a lark, we started pursuing computer vendors with ideas for how they could allow 19 schools to experiment first hand with their products. It did not take them long to realize the potential sales that might result from such an arrangement. In due time, it is expected that each ARKnet node will provide exploratory access to its unique set of resources and a world of options will be available to us all.

We convinced ourselves of the value of ARKnet and apparently quite a few others too, because we ended up with an ARKnet configuration that spans the state. We are still waiting for formal notification on our NSF grant proposal. All indications are favorable at this time, and we expect good news soon. If the NSF proposal is selected for funding, the "save you more than you pay" pitch would become reality, at least for a while. With or without NSF funding, half of the ARKnet schools have indicated their willingness to participate. Earlier in this paper, we asked the question, "Can elephants fly?" The answer appears to be "yes."

However, if ARKnet is going to be a truly successful academic/research network, we will need additional partners in the future. We have already identified, and are pursuing, a number of potential extensions for ARKnet. The Arkansas Library Association is interested in expanding their cooperative efforts through ARKnet. The University of Arkansas was recently awarded a grant to establish the National Center for Resource Innovation/Southwest, one of four such centers in the r~tion. This will provide us an excellent opportunity to make a contribution to the national net ,rks via the implementation of a "GISnet." Another potential client that could enhance nat..nal resources is the National Center for Toxicological Research (NCTR) located in Jefferson, Arkansas. The University's Cooperative Extension Service, Agricultural Experiment Stations, and Engineering Research Center are all anxious to become part of ARKnet in order to solve current communication's difficulties. We have even been contacted by interested individuals, and have does some exploratory work, to investigate providing secondary (public) schools, vocational education schools, and rehabilitation services centers network access. Yes, elephants can fly! And with all of the interest that we have found in Arkansas, how about a flock of flying elephants?

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Networks Beget Networks

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North Dakota

The development of the North Dakota Higher Education Computer Network (NDHECN) in the mid 1970's was in response to the rapidly growing computing needs of the public post-secondary educational institutions. Because of the involvement of all these institutions, the NDHECN has contributed much more than computing services. It has promoted a sense of understanding among the campuses which has enhanced system-wide cooperative efforts including a library automation network and an interactive video network. The successful management structure of the NDHECN has been used as a role model for these other networks.

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INTRODUCTION: The development of the North Dakota Higher Education Computer Network (NDHECN) in the mid 1970's was in response to the rapidly growing computing needs of the public post-secondary educational institutions. The intent was to provide equal access to mainframe services from all institutions and to develop a uniform management system for financial and student records common to all institutions. As originally planned, the network has developed to include centralized mainframe academic services. Distributed mini and micro computer services are primarily provided by the institutions. The NDHECN services include a statewide data communications network. This facilitates connections, for all institutions, to external networks such as BITNET and NorthWestNet (NWNet), a regional network connected to NSFNet.

However, because of the involvement of all institutions, the NDHECN has contributed much more than computing services. It has promoted a sense of understanding among the campuses which has enhanced system-wide cooperative efforts including a library automation network and an interactive video network. The successful management structure of the NDHECN has been used as a role model for these other networks.

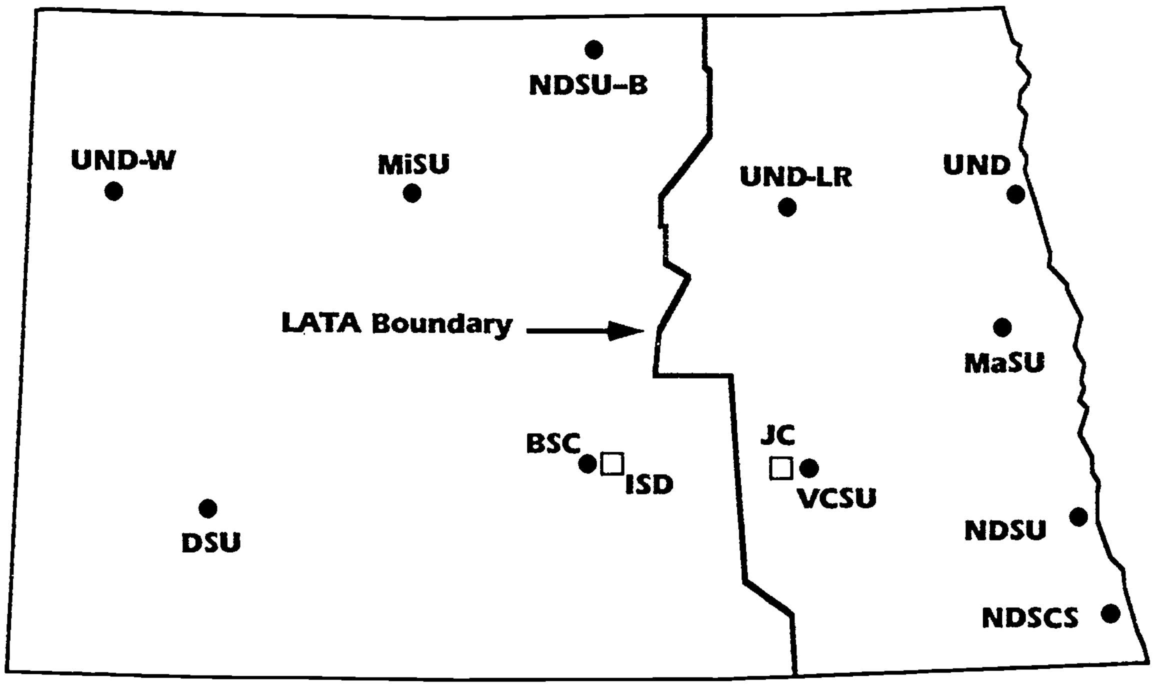
Finally, of considerable importance, the NDHECN staff includes programmer/analysts to provide software development and support for uniform financial and student records systems. These systems not only serve the individual institutions but provide a uniform reporting system to the higher education governing board, the North Dakota State Board of Higher Education (NDSBHE). The uniform systems report comparable institutional data which assists this board's involvement in the legislative process.

OVERVIEW: The activities and services described herein will be more meaningful with a brief description of the setting in which they take place.

North Dakota is a very rural state. Its 653,000 inhabitants occupy a geographical area approximately 350 miles east-to-west by 200 miles north-to-south. State public higher education services are centered on the eleven campuses of eight institutions. There are five two-year campuses, three four-year campuses, one masters level campus, and two doctoral level campuses. Both doctoral level campuses, North Dakota State University and the University of North Dakota, are located on the eastern border. These eleven campuses form the North Dakota University System (NDUS). The locations of the campuses are shown in Figure 1. Also included are two other nodal sites serving the NDHECN.

Total enrollment in the NDUS is 33,754 ranging from 450 at North Dakota State University - Bottineau to 11,885 at the University of North Dakota. The NDUS has 2,060 FTE faculty and research professionals. Grant/contract activity at the doctoral institutions totals in excess of $50 million annually.

NODAL Sites Serving the NDHECN



	● NDUS Institutions	Level	Location
BSC	Bismarck State College	2 year	Bismarck
DSU	Dickinson State University	4 year	Dickinson
MaSU	Mayville State University	4 year	Mayville
MiSU	Minot State University	masters	Minot
NDSCS	North Dakota State College of Science	2 year	Wahpeton
NDSU	North Dakota State University	doctoral	Fargo
NDSU-B	NDSU - Bottineau	2 year	Bottineau
UND	University of North Dakota	doctoral	Grand Forks
UND-LR	UND - Lake Region	2 year	Devils Lake
UND-W	UND - Williston	2 year	Williston
VCSU	Valley City State University	4 year	Valley City

	□ Other Facilities/Institutions	Purpose	Location
ISD	Information Systems Division	State government computing and communications	Bismarck
JC	Jamestown College	4 year private college	Jamestown

FIGURE 1

THE COMPUTER NETWORK: The requirements for computing services grew rapidly following the installation of computers at NDSU and UND in 1961. This growth was accompanied by escalating funding requirements for the new service. As a result, the governing board, i.e. the NDSBHE, imposed a "freeze" on computer acquisitions to provide time for a thoughtful study. The freeze occurred in the later 1960's and early 1970's during which time there were several studies (with varying conclusions). There emerged a consensus for centralized computing services. Then, in 1973, the institutions at Dickinson and Valley City were networked to the UND computer. This was followed by a more specific plan to have two central sites. The University of North Dakota was to network with all institutions to provide administrative services and, on a temporary basis, academic services. North Dakota State University was to further develop the network and eventually provide statewide academic services.

By 1978 the project managers for the Uniform Accounting System (later to become the Uniform Financial System) and the Uniform Student Record System had been appointed as had the first NDSBHE designated Director of Computer Services. Thus emerged an identifiable NDHECN. The network became "whole" in 1979 when NDSU became the academic host site with UND retaining administrative host site responsibilities.

To this day the network remains co-hosted by NDSU and UND for communication and centralized mainframe services. This arrangement has provided each NDUS institution convenient access to BITNET (1985) and NWNet (1987). Also in 1987 the NDHECN together with the state government communications/computer Information Systems Division (ISD) developed an in-state communications network linking all eleven campuses, ISD, and numerous state, county, and local government offices. This cooperative effort resulted in a network called the North Dakota Information Network (NDIN). NDIN node cities which also service the NDHECN are shown in Figure 1. NDIN made possible more convenient electronic data transfer between the NDUS institutions and ISD. Current planning efforts are directed toward enhancing NDIN with TCP/IP. Because ISD is also responsible for state government voice communications it is anticipated that within a year or two both NDUS data and voice communications will be a part of NDIN.

A Fall 1989 snapshot of the NDHECN would reveal the following statistics: 2 mainframe computers (IBM 3090-200Es, one with one vector facility), 50 minicomputers and 4,775 microcomputers (3,115 academic, 1,468 administrative, and 192 combined). Combined mainframe usage was 28.8% administrative, 21.8% instruction, 49.0% research, and .4% other.

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The management structure for the NDHECN is shown in Figure 2. Descriptive functional titles of advisory committees are used in place of actual titles to more clearly indicate the responsibilities to the NDHECN. As illustrated in Figure 2, the NDHECN is the responsibility of the system Vice Chancellor for Administration who also serves as Director of the NDHECN. Not illustrated is the dual reporting responsibility of the computer center directors at the two co-hosts. Both directors are responsible to the Director of the NDHECN and each reports to a vice president at their respective institution. This dual role has significantly contributed to the success of the network.

Both co-host computer center directors are members of the Executive Committee as are the project directors for the uniform financial and student record systems, and the manager of NDHECN academic user services. The committee is chaired by the Director of the NDHECN. In addition to on going management responsibility for the NDHECN, this committee forms the core of a larger, more diverse, statewide committee which is formed by the Director of the NDHECN every two years to recommend a biennial plan for network services and the related budget. It is this plan which is used by the NDSBHE to form and support the legislative funding request for the NDHECN.

THE LIBRARY NETWORK: Campus library automation services were recommended in a 1983 UND strategic academic computing plan developed at the request of the university president. Upon acceptance of the plan, campus planning activity for library automation increased significantly with a focus to determine the most appropriate automation system and to identify the required funding.

Simultaneous efforts, largely initiated by the North Dakota State Library, were underway to plan for library automation to potentially serve all libraries in North Dakota. The North Dakota State Director of Institutions, to whom the State Library is responsible, and the UND Vice President for Academic Affairs were Executive Sponsors for an IBM Application Transfer Team which assisted a select statewide committee to study library automation needs in North Dakota. This team interviewed over 50 librarians from 40 libraries of various types (academic, public, school, and special). In November, 1985, the team issued an extensive report which was used as a basis for a funding request from the legislature. Economic conditions within the state were a major factor in unsuccessful attempts to obtain the required funding from the 1987 and 1989 Legislatures.

In addition to the aforementioned planning efforts, the NDHECN strategic planning documents of 1986 and 1988 identified the need for the NDHECN to enhance its statewide communications network to prepare for network communication services supporting library automation.

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NDHECN ORGANIZATION

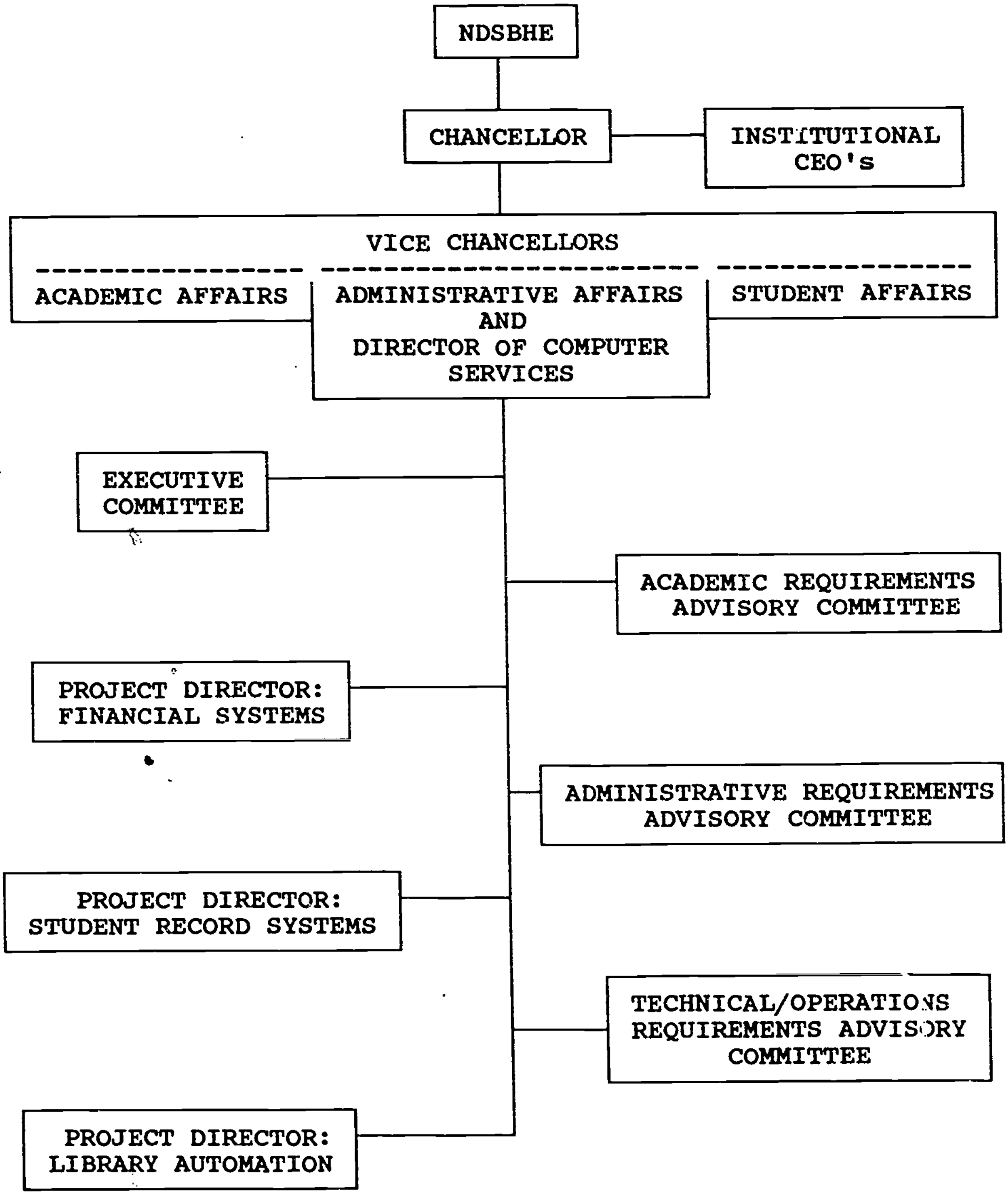

FIGURE 2

With these extensive planning efforts it was inevitable that once funding was available implementation of a library automation system would rapidly follow. So it was! The determination in early 1988 that gift funds recently received by UND could be used for a library automation project was rapidly followed by the preparation of a request-for-proposal for an automation system. During preparation of the RFP the Director of the NDHECN requested UND to include in the RFP, as an option, an automation system configuration that would eventually serve all the system institutions except NDSU and its branch campus NDSU-B. The exclusion of NDSU was because NDSU already received library automation support from the Minnesota State University System (MSUS) by virtue of membership in the Tri-College University. The Tri-College University is a consortium consisting of NDSU in Fargo, ND and two institutions, Moorhead State University and Concordia College, located in adjacent Moorhead, MN. The MSUS uses the PALS (Project for Automated Library Services) software developed at one of the MSUS institutions, Mankato State University.

In June, 1988 the NDUS decided to implement a library automation network. The fact that PALS was being used by MSUS to serve a forty-seven member library consortium and was being installed to support the South Dakota Library Network was a significant factor in the NDUS choice of the PALS software. With this choice it became technically possible to link the library networks in Minnesota, and North and South Dakota. Because of this possibility (presently becoming a reality), NDSU chose to remain a member of the MSUS library network.

Installation of a UNISYS 2200/202 computer system occurred in early 1989 at the UND Computer Center. Initially, the network was to support all libraries at seven of the eleven NDUS institutions. NDSU and its branch NDSU-B and the UND branches UND-LR and UND-W were not included. Eventually UND-LR and UND-W will become participants.

The seven founding institutions had collective holdings of 844,000 records, 1,006,000 titles, 1,272,000 volumes, and an annual circulation of 411,000. To serve these libraries, the initial configuration costs were $670,000 for host site hardware/software and site preparation, $264,000 for workstations/terminals/printers and $120,000 at the remote campuses for communication equipment. These costs do not include data transmission which, because of NDHECN strategic planning efforts, is provided by the NDHECN.

At the time of installation, there were twenty-one OCLC libraries in North Dakota that were not utilizing the type of services being provided by the UNISYS 2200/202 installation. As the library network developed it became attractive to libraries in addition to those at the founding seven institutions. All but two of the twenty-one OCLC libraries are located in a city in which there is also located a public higher education institution. Fortunately,

the NDHECN though its NDIN affiliation has data/voice access to numerous cities not served by the NDHECN. One such city, Jamestown, is the home of a private college. Jamestown College together with public libraries in Fargo and Grand Forks, the North Dakota State Library in Bismarck, and the founding seven institutions presently form the library automation network. In recognition of the centrality of a library to the purposes of educational institutions, the network has been named ODIN after the chief and wisest god of Norse mythology.

Convenient access to a state-based data communication system is a primary asset permitting the UND-based PALS system to provide an affordable service to more libraries than the founding seven. For this reason, and the service commitments of public higher education institutions, the NDHECN governance structure of the library automation project has established guidelines to provide automation services to other categories of libraries (private academic, public, state agency, etc.). The governance structure fits within the NDHECN by having a project director reporting to the Director of the NDHECN as shown in Figure 2. The project director in turn has an advisory council consisting of one member from each NDUS participating institution, one member from the NDSU library, one member from the ND State Library, and two representatives from the non-NDSBHE participating libraries. The rationale for the organizational structure is the recognition that the project is a NDHECN service which will also provide "service bureau" type contractual services to those libraries interested in participation. The service bureau activity has thus far required an upgrade to a UNISYS 2200/401 including an increase of approximately fifty percent disk storage. It is a goal of the automation project to utilize networks and dial-in services to provide direct citizen access to the library databases.

THE INTERACTIVE VIDEO NETWORK: The NDUS implemented an interactive video network (two-way audio, two-way video) on six campuses for the Fall 1990 term. By January 1, 1991 ten of the campuses will be serviced by this network. At present NDSU-B is not planning a connection to this network.

Although the North Dakota Interactive Video Network (NDIVN) is not a part of the NDHECN, the management structure of NDIVN is similar to that of the NDHECN. In fact, initially NDIVN was the responsibility of the NDUS Vice Chancellor for Administration, i.e., the same person who is Director of the NDHECN. However, once the network was technologically configured and installed, the primary concerns of NDIVN changed from technology to academic programming. As a result, NDIVN became the responsibility of the Vice Chancellor for Academic Affairs.

The development of NDIVN was partially enabled when the 1989 State Legislature appropriated $700,000 to the NDUS for the establishment of a video network. There were also other groups interested in

video networks to serve their needs. One such state agency, the Department of Public Instruction, also received funding to continue the development of video networks for K-12 schools. To insure the various interest groups developed compatible networks the legislature established an eleven member Educational Telecommunications Council (ETC) with its own funding and a charge to encourage and direct the creation of educational telecommunications programs and systems within the state. The ETC contracted for professional engineering and consulting services to develop a statewide plan for needed telecommunications services.

The consultant's report of April, 1990 included a far-reaching recommendation that a statewide telecommunication network should include both computing and video services for K-12, postsecondary and lifelong learning activities. The suggested computing services would preferably be delivered by an extended NDHECN. Toward that end, the NDHECN and NDIN are presently planning an enhancement which would begin to address the needs identified in the consultant's report. Similarly, the NDUS and local consortia of school districts are implementing and planning for interactive video networks.

The implementation of NDIVN will connect the campuses in the west lata shown in Figure 1 to a Digital Access Cross-connect Switch (DACS) and Multipoint Control Unit (MCU) located in Bismarck. The campuses in the east lata are similarly connected to a DACS/MCU in Fargo. The two DACS/MCU units are then connected with two T1 lines. With the installation of a "cascading" feature, which enables the two MCU's to act as one, up to seven of the eastern sites (both NDSU and UND have two video classrooms making eight eastern sites) and all four western sites (NDSU-B excluded) can be connected in one interactive conference using only one of the T1 lines connecting the DACS/MCU units.

The equipment to implement the NDIVN double star network totals approximately $1.1 million. In addition to legislative appropriations, a portion of this expenditure and related operating expenditures will come from a United States Department of Agriculture grant to NDSU and UND. The grant to the NDSU Extension Service Center for Rural Revitalization and the UND Center for Rural Health Services, Policy and Research is for the development of a model program to utilize telecommunications to expand health and social science education outreach programs in a rural area. The governing board of the rural health project worked cooperatively with the governance structure of NDIVN to plan, implement, and now operate NDIVN.

As a result of the rural health project, in the Fall 1990 term UND began to deliver undergraduate course work in medical technology, nursing, and social work to video classrooms at DSU, VCSU, UND-LR, and UND-W. To do this required the NDUS to consider not only technological issues but other complex financial and academic

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issues such as student financial aid, which institution (the sending or the receiving campus) retains tuition, and which institution maintains the students' academic records. The fact that the NDUS has uniform financial and student record systems will facilitate the resolution of these issues.

SUMMARY: The development of the NDHECN has been accompanied by an increased sense of understanding and cooperation among the eleven NDUS campuses. The existence, experience, and strategic planning activities of the NDHECN have facilitated membership in NorthWestNet and guided and enabled ODIN. Presently ODIN has three modules operational (on-line public access catalog, circulation, and interlibrary loan) and is on schedule for implementation of the other modules and for connection to other states. The management structure is now reviewing the operational guidelines to better serve additional libraries. NDIVN, the newest network, is yet evolving both technologically and policywise.

An extensive multiyear statewide study has identified needs to be addressed for North Dakota to better support economic development efforts and to secure the economy of the state. A statewide telecommunications network is one of the identified needs. The North Dakota University System through the NDHECN, ODIN, and NDIVN is a major contributor to such a network.

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Networking in Residence Halls: Participation, and Impact

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Abstract

The Residence Halls Computing Program (ResComp), jointly funded by the Housing Division and the Information Technology Division at The University of Michigan, loans Apple Macintosh computers to all student resident staff. Being connected to the campus computing network, these approximately 300 staff in 16 residence halls are required to use electronic mail and conferencing in their jobs and are encouraged to use these networking resources in their academic work and personal tasks. A pilot computer loan program in 1985-86 and extensive monitoring during the past three years of the program have demonstrated the validity of the assumption that electronic communication facilitates the work of resident staff. This paper shares experiences and findings from this program and provides insight into a) how resident staff use networking and b) the academic and personal impacts of networking on resident staff and the students living in their residence halls.

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Networking in Residence Halls: Participation and Impact

Philosophy and Assumptions

The University of Michigan is committed to ensuring that students have a firm understanding of the application of technology to levels that guarantee both academic and professional success. To this end, the Residence Halls Computing Program, ResComp, was created in 1985 through the collaboration of the Information Technology and Housing Divisions. The primary goal of ResComp is to provide computer education and consulting services to approximately 10,000 students living in the residence halls. Non-credit computing classes, taught by paraprofessional staff, allow for flexibility in the implementation of a wide-ranging curriculum that closely reflects the changing technology and the academic demands of the students. In addition, the use of paraprofessional staff provides excellent leadership opportunities for students interested in pursuing such careers as teaching and management.

A comprehensive research program operates in parallel with these services. The research program regularly evaluates the delivery of service; monitors changing skill levels, needs and expectations of the students; and studies the influence of electronic communication on a subsample of the residence hall community: the resident staff.

The purpose of this paper is to summarize the findings regarding the impact and influence of networking in general, and electronic communication in particular, on how the resident staff fulfill the responsibilities of their position and how networking has enhanced the development of the living-learning environment of the residence halls.

Setting and Resources

The resident staff are a group of over 300 graduate and undergraduate paraprofessionals, whose major responsibility is to foster an environment that facilitates the social, academic and cultural development of residence hall students. Resident staff work in such capacities as Resident Advisors, Resident Fellows, Resident Directors, Minority Peer Advisors, ResComp Trainers and Head Librarians.

Since September, 1987, the University of Michigan and Apple Computer, Inc. have been in a partnership that provides each resident staff room with a networked Macintosh and communications software. Each Macintosh is connected to the campus network, UMnet, which gateways not only to Merit, a network consisting of several colleges and universities in the state of Michigan, but also the Internet, the international computer network. In addition, resident staff have access to additional software including word processing, graphics, spreadsheets and HyperCard™. Since January, 1990, the resident staff of one particular residence hall, South Quadrangle, have had access to an AppleShare™ server.

The reason for placing networked Macintoshes in resident staff rooms is rooted in the philosophy that in general, resident staff are critical role models to students as they pursue an undergraduate degree. By equipping each resident staff member with a networked computer, residence hall students have an opportunity to interact with resident staff and learn the importance of using networks as an aid in academic efforts by accessing databases, as a way to develop projects through collaboration over networks, and as a means of communication with faculty, staff and other students. In addition,

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students observe resident staff actively engaging in electronic communication as a means of fulfilling the responsibilities of their position.

Electronic communication over UMnet occurs by use of 1) an electronic mail application known as the MTS (Michigan Terminal System) $Messagesystem, and 2) conferencing software entitled Confer II™ by Advertel Communications. The $Messagesystem, like many electronic mail applications, is used to send a message to one or more recipients with an option to reply to one or more individuals. The responses to a message are private in that only the designated recipients may see the message. The $Messagesystem is generally used in non-real time but some options allow for real-time exchange of private communication. Confer II™ allows for non-real time electronic communication that may be viewed and responded to by any participating member of the electronic conference. Thus, electronic conferencing is best-suited for discussions involving a group of participants. Conferences may be designated as private (restricted membership) or public (open membership). In addition to electronic messaging and conferencing, resident staff have access to databases such as MIRLYN, an online library research tool that allows searches for books and periodicals by title, author and keywords; UM-CIC, a database that provides information regarding special events on campus and throughout the Ann Arbor area; and UM-CRISPINFO, an online course guide that features the current status of course availability.

In order to guarantee consistent implementation of the resident staff Macintosh loan program, each resident staff member is contractually obligated to fulfill several requirements. These requirements include 1) signing on once a day to send and retrieve messages, 2) participating in private staff conferences for their designated staff group, 3) completing research and evaluation questionnaires, and, in some cases, 4) participating in interviews and completing communication logs. During the summer preceding their term of employment, each resident staff member completes a questionnaire, entitled "Computer Experiences Questionnaire," that is designed to assess their interests and skill in using technology. From this questionnaire, a wide range of classes is designed and corresponding documentation is created to meet the needs of the incoming staff. These classes occur during the week preceding the start of the academic year and oftentimes continue throughout the year at the request of the staff group. In special cases such as the AppleShare™ network in South Quadrangle, resident staff receive additional training in accessing the network to share graphics used to advertise residence hall programs and to prepare monthly reports that summarize programmatic activity in the residence hall.

Evaluation of the Impact of Computer Networking

Data Collection

The research and evaluation component of ResComp has been systematically assessing computing experiences, expectations, and attitudes of entering freshmen and resident staff since the 1985 fall term. Since that time three entering freshmen classes (85, 86, and 87) have responded to a paper-pencil questionnaire, entitle "the Freshman Questionnaire," and three entering freshmen classes (88, 89, and 90) have responded to the same questionnaire in an online form. The first four freshmen classes to experience ResComp were again surveyed, with a paper-pencil questionnaire, entitled "the Freshman Follow-Up Questionnaire," at the end of the 1989 winter term, when the first four classes were, respectively, freshmen, sophomores, juniors, and seniors. Data from Resident Staff are more extensive. In the first two years of the loan program (87-88 and 88-89), staff responded to two online questionnaires, one in November and one

in March. In the third year of the loan program, the online questionnaire was administered only in January (1990). At the end of the 1990 winter term, interviews with staff from six buildings were conducted to maximize qualitative information about the efficacy of the program. Table 1 presents a summary of the ResComp data sets.

Table 1.--ResComp Data Sets

Academic Year	Student Data	Resident Staff Data
1985-86	Freshman Questionnaire	
1986-87	Freshman Questionnaire*	
1987-88	Freshman Questionnaire*	Computer Experiences Questionnaire November Online Questionnaire March Online Questionnaire
1988-89	Freshman Questionnaire	Computer Experiences Questionnaire November Online Questionnaire
	Freshman Follow-Up Questionnaire*	March Online Questionnaire
1989-90	Freshman Questionnaire	Computer Experiences Questionnaire January Online Questionnaire* March Interviews*

* Used in this report.

The data presented in this paper to assess the impact of networking on resident staff come from the following data collection points:

- the January, 1990, Resident Staff Online Questionnaire. This questionnaire included both structured and free-response questions about how the loan computers were being used and the effects of the program.
- the winter term, 1990, staff interviews. These data provide specific examples of how the loan computers were used and the effects of the program.
- the 1986 and 1987 freshman questionnaires. The majority of the January, 1990, staff were freshmen when these two questionnaires were administered. These responses, then, serve as baseline data to evaluate the staff responses in January, 1990.
- the winter, 1989, follow-up questionnaires. The responses from these questionnaires come from students who were not staff and thus provide a direct basis for assessing program effects.

Impact on Resident Staff Work

As part of the loan program, staff were required to access the $Messagesystem once each day. For the most part, the staff exceeded this requirement. As is evident in Table 2, about seventy percent of the staff used the loan computers at least one hour a

day; nearly sixty percent signed on to the $Messagesystem at least twice a day. Only eight percent used the $Messagesystem less than required by the terms of the contract.

Table 2.--Daily Computer and $Messagesystem Use by Resident Staff in the 1989-90 Academic Year, N=290

Daily Computer Usage	Percentage	Daily Use of $Messagesystem	Percentage
More than 4 hours a day	4.1%	More than 2 times a day	20.3%
From 2 to 4 hours a day	18.3	Twice a day	38.3
From 1 to 2 hours a day	47.2	Once a day	33.1
Less than 1 hour a day	29.0	Less than once a day	8.3

Use of the $Messagesystem correlated significantly with attitude towards using computers for communication. The more frequently the $Messagesystem was used, the stronger the agreement with the statement, "Computers help me communicate with others." This relationship (chi square = 27.25, p = .0001) is illustrated in Table 3. Staff usage of the $Messagesystem went beyond minimum requirements of the computer loan program; usage was seen as having significant value.

Table 3.--Relationship between $Messagesystem Use and Attitude towards Communication by Computer, Resident Staff in the 1989-90 Academic Year

	"Computers Help Me Communicate with Others"		
Daily Use of $Messagesystem	Strongly Agree, N=95	Agree, N=133	Undecided, Disagree, Strongly Disagree, N=60
More than twice a day	31.6%	17.3%	10.0%
Twice a day	43.2	40.6	25.0
Once a day	20.0	33.8	51.7
Less than once a day	5.3	8.3	13.3

With respect to specifically work-related usage, the $Messagesystem and/or the conferencing system were used by a strong majority of resident staff to make appointments or plans with other staff (94%) and to communicate with their building directors (88%). Slightly less than half used computer communication to discuss confidential matters with staff (46%). The percentage distributions of computer communication for these three staff work usages are presented in Table 4. Almost no one used conferencing alone as a communication tool. The $Messagesystem alone was most frequently used to communicate with their supervisors, the Building Directors, generally a direct, one-to-one type of communication. Both conferencing and the $Messagesystem were used for making plans with other staff. These communications can be one-to-one or one-to-many, which suggests that small groups as well as large groups of staff may make plans via computer communications. The $Messagesystem was the method of choice for the minority who would use computer communication for discussing confidential matters.

In the interviews, the staff of one building presented a very vivid example of how the $Messagesystem was invaluable during a building-wide crisis. This particular hall experienced a "food poisoning" scare, which turned out to be a virus. During the crisis, the $Messagesystem was used to pass accurate information quickly between building director and staff without having to take precious time to type, copy, and distribute paper memos. Not only did the $Messagesystem provide immediate access to needed information, it also helped curb rumors and put misinformation into check. The value of being on a network was further emphasized by the fact that the epidemiologist assigned to

the case was not part of the network. The staff felt that communication would have been even better had this person also been a participant on the network.

Table 4--Resident Staff Usage of the $Messagesystem and Confer for Work-related Tasks

Usage	Making Plans with Other Staff	Communicating with Building Director	Discussing Confidential Matters
Just $Messagesystem	39.2%	60.8%	33.7%
Both $Messagesystem and Confer	52.1	25.5	9.5
Just Confer	2.4	2.1	2.5
Neither	6.3	11.5	54.4

In residence halls other than South Quadrangle, the staff expressed a strong need for additional software, especially graphics and drawing programs, to help them in their work and suggested that this software be available on a network if it were too expensive to provide separate disks for each staff member. Thus the staff are showing a sophisticated knowledge of what computers should be able to do for them. This is in contrast to common findings in computing needs assessment that respondents are not sure of the value and use of a network.

Staff also would like to have all of the paper work required for the position available on the network. Staff groups have demonstrated a great deal of initiative in this area and are experimenting with this in terms of forms and schedules.

Impact on Academic Work

Because the majority of the resident staff are juniors and seniors, it is instructive to use the junior and senior responses from the Winter, 1989, follow-up study to compare $Messagesystem usage. Through the computer loan program, the resident staff had extremely convenient access to computing. Juniors and seniors from the student body at-large may or may not have such ready access to computers. Any differences between staff and students at-large may be attributed in part to improved computer access. There was indeed a very large difference between the two groups with respect to percentage using the $Messagesystem to communicate with faculty. Sixty-nine percent of the resident staff, while only thirty-two percent of the juniors and seniors in the follow-up study, used computers this way. Ready access to a network increases the probability that students will use its capabilities to communicate with faculty.

Another way to determine the impact of computer communication upon academic life is to compare freshman expectations with actual staff outcomes. Entering freshmen in 1986 and 1987, when the majority of the winter, 1990, resident staff were freshmen, responded to a series of questions that asked what was the likelihood that they would use electronic communication in various ways. The online questionnaire taken by staff in January, 1990, asked if the staff had used electronic communication in these same, or similar, ways. The freshman-staff academic usage comparisons are presented in Table 5.

About half of the freshmen respondents thought it was likely that they would use electronic communication to make appointments with faculty or to ask questions of faculty. Fifty-two percent thought they would use electronic communication to discuss course work with classmates. In the resident staff sample, seventy-two percent actually

communicated with faculty on the computer, while fifty-five percent used the computer to discuss course work with classmates. Communication with faculty occurred more frequently than expected, while communication with classmates was just about as expected from freshman responses. The pattern of resident staff communication for academic reasons was similar to the pattern for employment reasons. The $Messagesystem was the method of choice for communicating with faculty and building directors. Communication with peers (classmates and other staff) was, however, also accomplished via the conferencing system. Faculty are more likely than students to have ready access to computers, which may account for higher than expected communication with faculty.

Table 5.--Resident Staff Usage of the $Messagesystem and Confer for Academic Purposes Compared with Freshman Expectations for Using Electronic Communication for Academic Purposes

Response Group	Percent Who Would/Did Communicate with Faculty	Percent Who Would/Did Discuss Course Work with Classmates
Freshmen Likelihood	50.5%	52.0%
Staff Using Just $Messagesystem	53.0%	25.8%
Staff Using Both $Messagesystem and Confer	15.5	25.1
Staff Using Just Confer	3.2	3.9
Staff Using Neither	28.3	45.2

UM-CRISPINFO, the University of Michigan online course guide, was new in the academic year 1989-90. It took little time for CRISP to become exceedingly popular with both resident staff and the students in their halls. CRISP was frequently mentioned during the staff interviews and in the free comments sections of the online questionnaire as being an exceptionally useful database. Staff indicated that student traffic in and out of their rooms during registration periods was heavy. Staff and their students even developed strategies for using CRISP to its best advantage to learn quickly when spaces in popular courses became available through "drops."

Staff also expressed a deep appreciation of having the card catalog available online (MIRLYN). This database was a great time saver as well as an aid to doing more thorough research.

Word processing was, as expected, the most widely used application for academic purposes. Although word processing software was not networked except at South Quadrangle, the staff expressed a strong need for networked printers for their staff groups. Having machines without hard drives also emphasized to the staff the strong need for networked software to eliminate the necessity of multiple disk-swapping in using some of the larger applications. The expression of these needs again shows the appreciation the resident staff have gained for the value of computer networking.

Impact on Personal Life

A parallel question dealing with communication with friends was included in the Winter, 1989, follow-up study as well as on the staff online questionnaire in January,

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1990. Again a very large difference between the two groups with respect to percentage using the $Messagesystem was found. Eighty-seven percent of the resident staff, while only forty-eight percent of the juniors and seniors in the follow-up study, used computers to communicate with friends. Ready access to a network increases the probability that students will use its capabilities to communicate with friends.

The 1986 and 1987 freshman questionnaires contained several questions about using computers to communicate with friends. Similar questions were again asked in the January, 1990, online questionnaire. The comparisons between freshman and resident staff personal usage are presented in Table 6. More staff used electronic communication with friends that was expected from freshmen responses. The combination of the $Messagesystem and Confer was slightly more useful for making friends than for just communicating with them. Conferencing lends itself to personal expression which provides opportunity for getting to know one another.

Table 6.--Resident Staff Usage of the $Messagesystem and Confer for Personal Purposes Compared with Freshman Expectations for Using Electronic Communication for Personal Purposes

Response Group	Percent Who Would/Did Communicate with Friends	Percent Who Would/Did Make New Friends
Freshmen Likelihood	39.0%	44.0%
Staff Using Just $Messagesystem	58.2%	41.4%
Staff Using Both $Messagesystem and Confer	28.8	37.2
Staff Using Just Confer	2.5	7.7
Staff Using Neither	10.5	13.7

Tables 7 and 8 report the distributions for using electronic communication for giving and receiving advice. Personal advice is presented in Table 7, and computing advice is presented in Table 8. In the freshman questionnaires, giving/receiving was written into one item instead of two separate items as was done in the January, 1990, online questionnaire. The staff percentages for giving and receiving personal advice were much higher than expected. Incoming freshmen do not expect to use the computer for discussing personal matters, but, as resident staff, upperclassmen seem to be comfortable in using the computer to discuss personal matters. The uses of the $Messagesystem and Confer were very similar for both giving and receiving personal advice. As for computing, fewer gave than received advice, but the percentage who received computing advice was just about what would have been expected from the freshman responses.

Only thirty percent of the freshmen in 1986 and 1987 thought it was likely that they would use electronic communication to discuss political and other current issues. However, in January, 1990, eighty-seven percent of the resident staff had used electronic communication this way. The freshmen thought it was more likely that they would use electronic communication to learn about events on campus (76%) or about programs and services (83%). As for the resident staff in January, 1990, eighty-four percent had used their computers to learn about events, programs, and services, which is a very close match to freshman expectations.

Table 7.--Resident Staff Usage of the $Messagesystem and Confer for Giving/Receiving Personal Advice

Response Group	Percent Who Would/Did Give Personal Advice	Percent Who Would/Did Receive Personal Advice
Freshmen Likelihood	26.0%	26.0%
Staff Using Just $Messagesystem	42.1%	39.1%
Staff Using Both $Messagesystem and Confer	21.1	20.1
Staff Using Just Confer	3.9	3.2
Staff Using Neither	33.0	37.7

Table 8.--Resident Staff Usage of the $Messagesystem and Confer for Giving/Receiving Advice about Computing

Response Group	Percent Who Would/Did Give Computing Advice	Percent Who Would/Did Receive Computing Advice
Freshmen Likelihood	69.0%	69.0%
Staff Using Just $Messagesystem	17.7%	31.0%
Staff Using Both $Messagesystem and Confer	25.4	32.0
Staff Using Just Confer	3.9	5.6
Staff Using Neither	53.0	31.3

In discussion of the use of electronic communication during the staff interviews in March, 1990, the resident staff expressed how dependent they had become on the computer. Communication by computer became a way to keep up with friends especially since messages or confer entries could be made at any time, including times, such as 2:00 a.m. when one shouldn't be using the telephone. Checking messages had become a way of life. The interviewer would ask how they felt when they signed on and found that there were no messages waiting for them. The general reaction was: sad, unloved, let down. However, many said that never happened; there were sometimes too many messages to contend with. Staff felt that electronic communication made contacting someone not well known a lot easier than telephoning or visiting that person. As for conferencing, the general opinion was that conferencing allowed a venting of frustrations, stress relief, a chance to talk about frivolous things, as well as a chance to get to know staff better. In addition, the resident staff want to learn how to communicate with friends at other universities.

Summary and Conclusions

Staff expressed strong positive attitudes toward the computer loan program in general and toward electronic communication in particular. Staff rated their agreement with statements about the effects of the computer loan program on a five-point scale, where 1 = strong agree and 5 = strongly disagree. The means and standard deviations of these ratings are presented in Table 9. Staff do believe that the loan program had positive effects on their resident work. There was strong agreement that it made them

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more effective and helped them communicate. There was moderate agreement that they did not spend too much time using the computer and that the computer made their work easier. Reactions were more mixed but still positive in assessing whether using computers for communication made the staff closer or decreased the time the staff spends talking face to face.

Attitudes toward the loan program were correlated with network usage. Those who felt that computers helped to communicate with others, that the staff became closer because of computer communication, that computer use made the staff more effective, and that they did not spend too much time using the computer for the job were those who also used computer communication for a greater variety of purposes.

Table 9.--Resident Staff Assessment of the Computer Loan Program and the Use of Electronic Communication

Statement	Mean	SD
Using computers has made the staff more effective	2.0	.85
Computers help me communicate with others	2.0	1.01
I do not spend too much time using the computer for tasks for my job	2.3	.85
Using the computer has made my job as a staff member easier	2.3	1.24
Using computers for communication has made the staff closer	2.5	1.01
Electronic communication has decreased the time the resident staff spends talking face to face	2.7	1.19

One important outcome of this study is proof that the resident staff view electronic communication via computer networks as an additional resource, not a replacement for other modes of communication. Electronic communication minimizes paper work, assists with scheduling, and often increases the efficiency with which staff communicate with other students, staff, and faculty. Another important point contributing to the success of the computer loan program is that electronic communication allows staff to communicate at times that are convenient for them. Building Directors and resident staff alike unequivocally state that the most important effect of the computer loan program is that placing consistently reliable networked computers in staff rooms increases the availability of resident staff to students since the resident staff have ready access to academic and employment resources from their room through the network. As a result of the increased availability of the resident staff and the presence of network resources, resident staff use the technology as another venue for assessing the academic and social needs of their residents by observing how residents interact with the technology. In summary, networking resident staff has far-reaching benefits that include

- increasing the efficiency and productivity of the resident staff, both as staff and as students,
- localizing computer education on each residence hall floor,
- increasing the availability of resident staff, and
- providing another venue to interact with students.

The computer loan program has extended the concept of sustaining a living-learning environment in the residence halls through the successful integration of technology into the complex fabric of student life.

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THE INTEGRATION OF VOICE, DATA AND VIDEO SERVICES VIA A WIDE AREA NETWORK: TECHNICAL AND ORGANIZATIONAL ISSUES

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Abstract: The Maricopa Community College District serves ten colleges, two educational centers and over 91,000 credit students per semester with a digital voice, data and video wide area network. The Maricopa wide area network also includes connections with local high schools, elementary schools and four year institutions for the transfer of electronic documents, shared files and electronic mail.

The planning and implementation of Maricopa's wide area network has been achieved through a conscious strategy of managing change and leveraging vendor partnerships. The information technologies organizational structure has evolved along with the evolution of the wide area network, creating new job functions and opening up new opportunities for retraining and staff development.

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INTRODUCTION:

The Maricopa Community College District, located in the Phoenix metropolitan area, is the second largest community college district in the United States with eight (8) colleges and two (2) educational centers. With a service area of over 9,000 square miles, the Maricopa Community Colleges enroll more than 91,000 credit students and over 20,000 noncredit students each semester.

A major part of the Maricopa Community Colleges' mission over the past eight years has been to provide high quality services to faculty, staff and students through the use of state-of-the-art information technologies. This emphasis on the use of information technologies has led to the planning and implementation of a districtwide wide area network for the transmission of voice, data and video communications.

OVERVIEW OF THE MARICOPA WIDE AREA NETWORK

The Maricopa Community Colleges embarked on an ambitious computerization program in the early 1980's. The key feature of this plan was to decentralize computing with a distributed network of mini-computers along with a vast proliferation of personal computers. In the summer of 1982, there were approximately 150 personal computers or terminals available districtwide for students and staff for both academic and administrative uses. Eight years later, the Maricopa Community Colleges have over 8,000 terminals and personal computers in support of students and staff. Most faculty have workstations in their offices. Laboratories at the departmental level and large scale open labs also exist at individual colleges throughout the district. The large scale computing environment consists of eleven (11) VAX computers, all of the VAX 6000 family. The largest of these is a VAX 6440 and the smallest is a VAX 6410. These VAX computers are linked together at T1 transmission speeds via a districtwide digital microwave network which was completed in the spring of 1989. Over 2000 active ports are currently attached to the wide area network for data transmission.

In 1985, the Maricopa Community Colleges began planning and implementation of the Telecommunications Improvement Project. The overall goals of this project were to establish a universal wiring plan for voice, data and video communications, to upgrade or replace the college telephone systems and to construct the districtwide digital microwave network. By the spring of 1987, the project was completed. During this period, every workstation, classroom and conference room in the entire district was rewired for voice and data communications and every classroom and conference room was wired for video communications. The old, AT&T Dimension 400 telephone systems were replaced with new NEC NEAX 2400 digital PBXs with simultaneous voice and data capability. Voicemail systems and call accounting systems were also installed. Today, the Maricopa District operates ten (10) NEAX

2400 PBXs with over 4000 voice lines. Ninety-five percent of the instruments are digital instruments. There are over 3000 voicemail users within the district. The telephone systems are connected via the districtwide microwave network for five digit dialing.

Once the Telecommunications Improvement Project was completed and the districtwide digital microwave network was constructed, attention was focused on how the network might be used to transmit video among the colleges and the district office. With the help of NEC America, the Maricopa Community Colleges began the Video Demonstration Project in the spring of 1989. For one month, between the middle of April and the middle of May, shared instruction, meetings, staff development activities, and faculty discussions took place between Chandler-Gilbert Community College Center and Glendale Community College using the Maricopa digital microwave network and NEC's Visualink 3000 digital video codecs. During the one month period, over fifty separate events took place involving over 300 Maricopa faculty and staff.

The demonstration project was such a success that Maricopa moved immediately to equip four (4) colleges with this two-way video and two-way audio technology. At the present time, four colleges are using the system to share instruction and for video conferencing of meetings. A multi-point video switching device will be installed prior to the spring 1991 semester so that faculty can see and hear students at each site on the network.

STRATEGIES FOR THE IMPLEMENTATION OF INFORMATION TECHNOLOGIES

No institution can make the progress Maricopa has made in the implementation of information technologies without developing strategies to maximize the internal and external opportunities and to minimize or overcome the internal and external obstacles it may face. Three major strategies which have been identified by Maricopa are: (1) establishment of a centralized/decentralized technology environment, (2) use of the Concerns-Based Adoption Model (CBAM) for managing the change process, and (3) creation of partnerships with major technology providers.

Centralized/Decentralized Environment

The Maricopa Community College District consists of eight (8) semi-autonomous colleges. Each of these colleges is accredited separately by the North Central Accrediting Association; each has its own president and administration; each has its own faculty senate; each has its own curriculum and degrees; each has its own processes and procedures. The management direction for information technologies has, therefore, been to follow the overall management philosophy and give more and

more technology power to the colleges. Thus, each college has its own dedicated VAX computer; each has its own NEAX 2400 PBX and voicemail system.

Not all aspects of information technology could be decentralized, however. Standards for the acquisition of hardware and software are established centrally with the advice and participation of the colleges. In addition, software and hardware systems that are centrally managed remain centrally located. The accounting system and human resource systems are managed by staff located at the district office. The hardware and software that support these systems, therefore, remain at the district office. The library system is also centralized so that each college can take advantage of the districtwide library holdings.

This centralized/decentralized environment is managed through the use of active user groups for each of the technologies and the Information Technologies Executive Council (ITEC). The user groups are composed of representatives from each college and from the appropriate segments of the district office. Directed by the management of Information Technologies Services, these user groups make recommendations regarding policies, procedures and acquisitions to the Information Technologies Executive Council. ITEC reports directly to the Chancellor and manages the information technology function for the entire district. ITEC is composed of the four vice chancellors for the district, one college president, a member of the Maricopa Governing Board, one faculty member, a vice president from Arizona State University, and the Director of Information Technologies at Phoenix Union High School District. The latter two members are non-voting, ex-officio members.

Concerns-Based Adoption Model

When any new technology is introduced into an organization, its chance of success is dependent upon the ability of the individuals introducing the technology to manage the change process. The change process model used within the Maricopa Community Colleges is the Concerns-Based Adoption Model (CBAM) developed at the University of Texas at Austin. This change model postulates that change may be effectively introduced into an organization only if the members of the organization understand the vocabulary of the change, understand how the change will affect their lives, adopt the change within their own individual work environments, and adapt their activities to accommodate the new approach.

This is the philosophy upon which Maricopa began the Telecommunications Improvement Project. It was the goal of the telecommunications team to spend adequate amounts of time before equipment specifications were developed and equipment was purchased, to insure that faculty, staff and administrators were taught how telecommunications, particularly voice communications, could be used as a strategic tool to complete their jobs. It was also important that these groups had input into the type of hardware that was to be purchased.

Toward this end, one-on-one and small group discussions were held at each college. Information was disseminated to all employees in both print and electronic formats. Audio teleconferencing sessions were held as "open hearings" to give anyone and everyone an opportunity to contribute to the planning and design effort.

Partnerships with Technology Providers

The creation of partnerships with major technology suppliers has been a deliberate strategy of Maricopa. The three-way partnership among Digital Equipment Corporation (DEC), Information Associates (IA), and Maricopa began in 1983. Prior to that, there were informal relationships with these same companies. This partnership brought to Maricopa millions of dollars in hardware procurement savings from DEC and broad resources from Information Associates to develop new software packages.

Because of the success of the DEC/IA/Maricopa partnership, Maricopa entered into another partnership in 1988 with NEC America, Inc. and NEC Home Electronics (USA) for telecommunications and video equipment. The goal of this partnership was to advance Maricopa's use of voice and video communications. The Maricopa/NEC partnership has resulted in the successful demonstration and implementation of digital video across the districtwide wide area network and the installation of new, state-of-the-art video equipment at each of the Maricopa Colleges. Between 1990 and 1993, this partnership will enable Maricopa to upgrade its current telephone and voicemail systems at considerable savings to the colleges.

The newest Maricopa partnership is with The Robinson Group, a newly formed information access company. The Robinson Group (TRG) and Maricopa are planning to jointly develop instructional and instructional support software along with information access tools and technology.

Maricopa believes that vendor partnerships are not only a form of creative financing, but also bring additional strength to developmental efforts. In addition, these partnerships provide some advance knowledge of future directions, pre-release of products, and a safety net to protect against possible failures.

EVOLUTION OF THE INFORMATION TECHNOLOGIES ORGANIZATION

For the past eight to ten years, technical and management journals have been filled with articles related to the evolving organizational structure for information technology organizations. The ongoing arguments regarding the pros and cons of separate or combined administrative and academic computing organizations have been joined with the arguments for and against combining telecommunications and computing into

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a single organizational structure. If combined, which receives "top billing"; if separate, how do the two relate?

Historically, these functions were separate entities within the Maricopa District. In the late 1970's, computing was all done in a batch mode and was the domain of Computer Services. There was no such thing as "data communications" in our vocabulary. Telephone service was monitored by the Purchasing Department under the careful eye of AT&T and Mountain Bell. Television activities belonged in the Media Services department at each college.

Beginning in 1983, with the installation of the initial VAX computers linked with 56 Kbps dedicated telephone lines, computing and the new area of data communications, became joined in a new department called Management Systems and Computer Services. Telephones were still not acknowledged as a technology that needed to be managed rather than simply "acquired"; and television was still seen as an extension of the old classroom film and, therefore, still managed by Media Services.

With the divestiture of AT&T and the Bell System in 1984, the organizational environment began to change again. The Maricopa Community Colleges, like so many other educational institutions across the country, awoke one morning to find that there were many new telephone service and equipment providers and that the number of new voice technologies being introduced had multiplied almost over night. To keep pace with these changes, a new department of telecommunications was formed. This department was combined with computing and data communications in 1985 and a new umbrella organization called Information Technologies Services was born.

Between 1985 and 1990 use of information technologies within the Maricopa Community Colleges have continued to grow and expand. With the completion of the districtwide microwave network, the lines between voice, data and video communications became even more blurred and districtwide planning for video communications was finally absorbed into the Information Technologies Services area.

The evolution of the information technologies organization has brought more than mere departmental name changes to Maricopa. Specifically, this evolution has brought about new job opportunities for individuals within the district and new challenges for retraining and staff development. Each of the new job opportunities and all of the retraining challenges focus on the strategy of integrating voice, data and video communications.

Key among the new job opportunities are:

Director of Computing & Communications: This position is responsible for all day-to-day operations of Information Technologies Services, including all voice, data and video communications along with all software development, applications programming and library automation.

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Director of Technical Operations: This position is responsible for the maintenance and operation of the voice, data and video communications networks within the Maricopa District and oversees the technical staff in each of these areas.

Manager of Technology Planning: This position is responsible for the planing which must take place to integrate information technologies into new and ongoing facilities construction programs.

Manager of Network Operations: This position has primary responsibility for the maintenance and operation of the Maricopa wide area network, including fault isolation, fault resolution and capacity planning.

Manager of Research and Development: This position is responsible for researching new technologies and software applications for potential acquisition and implementation by the Maricopa Community Colleges.

The challenges of retraining and staff development are many as the roles of individuals within the organization are forced to change by the implementation and integration of new information technologies. First, the staff must be retrained to manage and operate the new technologies. This retraining can be both expensive and time consuming, particularly with the more advanced applications or hardware. Second, the staff must be retrained to work in self-managed teams rather than as individuals. The integration of technologies into one organizational structure means that teams must be used to approach and solve problems. Staff who are unable to work as team members cannot survive in this environment. Finally, staff must receive additional training in communication skills and customer service. Within Maricopa we have found that a majority of the "trouble calls" we receive in our Repair Services department are not really technology-related; they are people-related. In other words, there is often nothing wrong with the hardware or the software application. What is really wrong is the way in which the individual is using the hardware or software, the processes/procedures established by the individual's department, or the staffing in the individuals work area. Staff of the Information Technologies Services department must be trained to listen to the user, to probe to discover the true problems, and to communicate these issues in a nonthreatening and helpful manner.

PROJECTED AREAS OF GROWTH

The appetite for the acquisition and use of new technologies within Maricopa is horrendous. There are many more requests than can be accommodated within the resources available. This means that we have ambitious plans for expansion and growth for the upcoming five to ten year period.

In the area of computing and data communications, Maricopa plans to expand its use of local area networks and connection of these networks to the wide area network. This includes the use of multi-vendor hardware and software. We also plan to expand access to the network from homes and business locations through the use of laptop

and home computers. We believe that the affordable laptop computer may be the next major breakthrough in computing, giving students an opportunity to complete course work at times and places convenient to them and then "dock" with the network to submit the course work, receive new assignments and communicate with instructors and other students. We also plan to expand the ability of faculty, students and staff to access information in district databases and in external databases. This will be done through the use of new types of databases, new graphical user interfaces, and other new access technologies.

In the area of voice communications, we plan to equip one new college and the newly acquired District Support Services Center with new digital PBXs and state-of-the-art voicemail systems. These new voicemail systems combine the traditional voice messaging technology with automated attendants, call processing and audio text capabilities. Through the use of NEC's Open Application Interface, which allows the PBX owner to customize certain PBX functions, Maricopa plans to enhance its voice communications services to faculty and students and to upgrade the telephone systems at each colleges. Also included in the voice communications plans are expanded integrated voice response (IVR) applications. Currently, the Maricopa Community Colleges are using a touchtone registration system based upon the technology of Perception Technology Corporation and Information Associates Student Information System (SIS) software. The new IVR technologies which are now available will enable Maricopa to give students and faculty touchtone access to many other types of information and other types of online processes.

In the area of video communications, Maricopa plans to expand its use of the NEC digital video codecs to all locations so that every college will have the capability of originating and receiving two-way video and two-way audio communications for shared instruction and meeting purposes. Additional C/Ku band satellite downlinks will be installed over the next few years to allow Maricopa to expand its use of satellite-based programming for ad hoc videoconferencing and instructional support. We believe we will also see a further integration of computing and video as personal computers expand their capability of handling video signals.

Finally, the Maricopa wide area network will continue to expand. Connectivity with local high schools, elementary schools and four year institutions will grow as will access to home and local business sites. Maricopa is heavily involved in statewide and regional efforts to connect educational institutions for voice, data and video communications, and is among the leaders nationally in the use of telecommunications to reach international audiences.

CONCLUSION

In many ways, the Maricopa Community Colleges have demonstrated exemplary uses of technology to meet the needs of students and staff. In many ways, we still have room for improvement. If there is one area, however, where Maricopa's faculty and staff have excelled, it is in their combined commitment to not just "do more," but to "be more." If we can "be more" effective; if we can "be more" productive; if we can "be more" as part of our community through the creative uses of technology, we are obligated to work together toward that end. Maricopa's wide area network is the primary vehicle through which these goals may be obtained.

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CAUSE90
MIAMI BEACH
NOVEMBER 27-30, 1990

TRACK VI

MANAGING ACADEMIC INFORMATION SYSTEMS

Coordinators:
Tom Gabriele, Western Michigan University
Steven Gilbert, EDUCOM

Continued and rapid integration of merging technologies—computing, communications, classrooms—are dramatically affecting the way essential instructional services are delivered, and are changing the way "academic business" can be conducted. What will the new classroom include? And how should institutions prepare for this change? Papers in this track discuss issues related to these changes.

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Networked Information Resources and Services: Who Will Benefit, Who Will Make It Happen, and What's All the Fuss About, Anyway?

Abstract of
CAUSE90 Professional Presentation

Paul Peters
Director
Coalition for Networked Information

Many higher education institutions are nearing the completion of two major campus-wide technology development programs with long-term implications: installation of unified communications facilities in the form of advanced networks, and modernization of library operations and services through implementation of integrated computer-based information systems. Senior administrators of information technologies and senior administrators of libraries at such institutions are beginning to consider ways to leverage these considerable investments to enhance the scholarship and improve the intellectual productivity of their faculty, student, administrative, and community constituencies. The concept of "networked information resources" has recently captivated the imagination of a wide range of these administrators and their constituents alike

This CAUSE90 presentation elaborated this development and the various types of new partnership relationships that are beginning to emerge as vehicles by which to explore and realize the promise of this concept.

Access, Equity, and Academic Information—Including People with Disabilities in the Information Infrastructure

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ABSTRACT

Over the last 15 years, people with disabilities have become a visible presence in higher education. Enrollment of students with disabilities has increased from under 2 percent in 1975 to approximately 12 percent this year. Increased access is driven by several federal laws including PL94-142 (the Education of All Handicapped Children Act), Section 504 of the Rehabilitation Act, and the recently-passed Americans with Disabilities Act. This paper describes methods of integrating the end user with a disability into the academic information infrastructure.

Access for all – the EASI Way
Campus Computing for People with Disabilities
CAUSE 1990

Computers play a vital role in our nation's economy. Computer users are more competitive in their educational, professional, and personal lives. Adaptive computer technologies are those which enable people with disabilities to conduct activities leading to personal independence and employment. Having said that, today I will discuss with you both the demographics of disability, and current legislation that has created a demand for access to computer technology systems and services for disabled persons and the implications of such legislation for computing in higher education and beyond.

The number of people with disabilities in the general population is increasing. In terms of demographics, we have moved from 36 to 43 million Americans with disabilities over the past decade. Current data indicates that we have close to 5 million children and youth with disabilities in public schools today, and they graduate into postsecondary education at the rate of 180,000 each year! The percentage of college freshmen with disabilities has tripled in the past seven years . Current estimates place the proportion of students with disabilities on campus at over ten percent of enrollment. With total enrollment currently at 12.8 million — we are looking at a over a million students with disabilities! This increase in enrollment for students with disabilities is expected to continue as we improve early diagnosis of

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disabilities and as medical and technological advances are integrated into everyday living.

Of the 43 million Americans with disabilities, over 50% of are of working age, and 5 of 6 of Americans with disabilities acquired them during the course of their life. Of the 22 and a half million Americans with disabilities over 75% are unemployed! Can we afford to waste this much human potential?

Workforce 2000, the Hudson Institute report on the future of the American workforce, points out the need for ongoing retraining of workers to keep the aging American workforce competitive

And, as our workforce ages, with increasing numbers of workers with disabilities entering *or remaining in* the workforce, the need and expectation of access to the electronic highways of the information economy will increase.

Congress recognized that without access to technology and electronic information, federal workers with disabilities would be lost from the federal workplace, and designed Section 508 of the Rehabilitation Act of 1973 (1986 Amendments) *"...so that handicapped individuals may use electronic office equipment with or without special peripherals."* After October 1, 1988 computers purchased or leased by the federal government must be accessible to end users *"with or without disabilities."* Section 508 can be

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interpreted as federal recognition of the importance of computers in the workplace, comparable to the federal impetus provided by the Architectural Barriers Act of 1968, which set physical design criteria for alteration needed to accommodate persons with physical disabilities in the federal workplace.

The Americans with Disabilities Act (ADA) provides full civil rights for people with disabilities. Provisions of the ADA will impact on higher education and the campus computing marketplace. The following provisions of the ADA, exerpted from U.S.Department of Justice, Office for Civil Rights may raise questions on any campus.

General

Public accommodations such as restaurants, hotels, theaters, doctors' offices, pharmacies, retail stores, museums, libraries, parks, private schools, and day care centers, may not discriminate on the basis of disability. Private clubs and religious organizations are exempt.

Reasonable changes in policies, practices, and procedures must be made to avoid discrimination.

Auxiliary Aids

Auxiliary aids and services must be provided to individuals with vision or hearing impairments or other individuals with disabilities, unless an undue burden would result.

Physical Barriers

Physical barriers in existing facilities must be removed, if removal is readily achievable. If not, alternative methods of providing the services must be offered, if they are readily achievable.

All new construction in public accommodations, as well as in "commercial facilities" such as office buildings, must be accessible. Elevators are generally not required in buildings under three stories or with fewer than 3,000 square feet per floor, unless the building is a shopping center, mall, or a professional office of a health care provider.

Alterations must be accessible. When alterations to primary function areas are made, an accessible path of travel to the altereli area (and the bathrooms, telephones, and drinking fountains serving that area) must be provided to the extent that the added accessibility costs are not disproportionate to the overall cost of the alterations. Elevators are required as described above.

Employment

Employers may not discriminate against an individual with a disability in hiring or promotion if the person is otherwise qualified for the job. .Employers can ask about one's ability to perform a job, but cannot inquire if someone has a disability or subject a person to tests that tend to screen out people with disabilities. .~ Employers will need to provide "reasonable accommodation" to individuals with disabilities. This includes steps such as job restructuring and modification of equipment. .~ Employers do not need to provide accommodations that impose an "undue hardship" on business operations.

•Timelines to Comply:
All employers with 25 or more employees must comply, effective July 26,1992.
All employers with 15-24 employees must comply, effective July 26,1994.

Public Transit

New public transit buses ordered after August 26,1990, must be accessible to individuals with disabilities. . Transit authorities must provide comparable paratransit or other special transportation services to individuals with disabilities who cannot use fixed route bus services, unless an undue burden would result. . Existing rail systems must have one accessible car per train by July 26,1995. New rail cars ordered after August 26,1990, must be accessible. .New bus and train stations must be accessible. .Key stations in rapid, light, and commuter rail systems must be made accessible by July 26,1993, with extensions up to 20 years for commuter rail (30 years for rapid and light rail). All existing Amtrak stations must be accessible by July 26, 2010.

Telecommunications

Companies offering telephone service to the general public must offer telephone relay services to individuals who use unications devices for the deaf (TDD's) or similar devices.

The ADA is historically tied to both the Civil Rights Act of 1964 and to Title V (civil rights and non-discrimination) of the Rehabilitation Act of 1973.

Section 504 of the Rehabilitation Act mandates non-discrimination on the basis of handicap in programs receiving or benefiting from federal financial aid. Section 504's implementation

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on campus over the past 13 years may be seen as the preface to the implementation of ADAin the community at large

We are now in the thirteenth year since the Regulations implementing Section 504 were implemented and the fifteenth year since the Education of All Handicapped Children Act (PL 94-124) opened classrooms to children with disabilities.

Today, students with disabilities have access to an expanded universe of educational options. In the early days student access,was concerned with physical access to buildings for students with limited mobility. a decade and more later, issues of physical access have largely been resolved, and questions revolve around full participation by students with disabilities in the full range and scope of academic life and their transition to the workplace.

The recently passed Technology-Related Assistance for Individuals with Disabilities Act of 1988 PL 100-407, is mandated to create a series of "statewide...age inclusive.. assitive technology services..." will create markets for accessible assitive technologies in each state. Maryland, as one of the first nine states funded by the department of education, has been joined by an additional 13 states. By 1995, Technology-Related Assistance Programs will be operating in all 50 states. All "Tech Act" states are funded with inclusion of a "508 compliance" assurance. This assurance appears to indicate that

Section 508 may also come to serve as a checklist for non-discriminatory computer access in programs which, while covered under Section 504, are not now covered directly by 508 but are covered under Section 508, and are expectd to be covered under ADA regulations.

With the passage of ADA, institutions may find themselves retracing the early days of Section 504 compliance. One of the most instructional of the early accessibility issues that arose was that of access to the campus library, for without access to the full range and scope of library materials and services, and an understanding of library use, students with disabilities were placed at a severe competitive disadvantage.

Many college courses include computer use as part of normal classwork. On many campuses, instructors in humanities and the sciences *assume all students will have computer access as readily as access to the library.* Employers also are beginning to assume computing skills, and ready access to computers as part of those basic skills required of new employees. For institutions to meet the increased computing needs of students with disabilities, while on campus and in preperation for employment, additional adaptations to existing campus computer facilities are needed, including general use PC labs, terminal rooms and computerized library catalogs. Campus computer centers or IRM administrators

will need specialized resources to meet these needs. Many colleges and universities, guided by the American Council on Education, Project EASI and the Association on Handicapped Student Service Programs in Postsecondary Education use Section 508 as a guideline for assuring 504 compliance on individual campuses. The University of Missouri-Columbia, and UCLA are two outstanding examples of integrating computer access in mainstream computing. The High-Tech Centers of the California Community College system are a resource for two year programs.

The ongoing systems change in access to technology, driven by sections 504 and 508, now fueled by the advent of ADA presents the campus computing community with the opportunity to include all potential users. Project EASI and others are ready to help you meet this challenge.

Managing Academic Information Systems in a Dispersed Environment

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ABSTRACT

SUNY/Empire State College is not unique in recognizing that the rapid integration of merging technologies will dramatically affect the delivery of essential academic services. But ESC is unique in demonstrating that it is not necessary to have a campus in order to have a college. For twenty years, we have enabled working adults to complete a college degree by linking them to faculty, libraries, laboratories, internships and other learning resources without asking them to leave their homes or their places of employment. ESC is the largest and most successful free-standing non-traditional college for adults in the U.S., a "university without walls" enrolling more than 10,000 students throughout New York State each year. Having developed institutional structures and teaching methodologies that converge with the technological developments of the last decade, ESC's approach to the integration of information technology in higher education provides a microcosm of how "academic business" may be conducted in the twenty-first century. This presentation will describe how ESC manages academic information systems in a dispersed, decentralized environment.

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SUNY/Empire State College is a unique and exciting institution--a "university without walls" enrolling more than 10,000 students throughout New York State each year. Empire State is the largest and most successful free-standing non-traditional college for adults in the United States. Founded in 1971 to serve students who need an alternative to classroom attendance and residential life found at traditional colleges and universities, ESC has developed institutional structures and teaching methodologies that converge with the technological developments of the last decade. Internationally recognized as a leader in distance learning, Empire State's approach to the integration of information technology in higher education provides a microcosm of how "academic business" may be conducted in the twenty-first century.

Like many corporations, ESC has a dispersed organizational structure. Empire State is itself a network of a certain kind--a network connecting people to people and people to learning resources--that lends itself to the deployment of computer intelligence to enhance its instructional capabilities. For twenty years, we have enabled working adults to complete a college degree by linking them to faculty, libraries, laboratories, internships and other learning resources without asking them to leave their homes or their places of employment. Empire State College has demonstrated that it is not necessary to have a campus in order to have a college, that a high quality education can be provided by networking people to people and people to resources.

Institutional Background

Empire State was created by the State University of New York to develop alternative approaches to higher education that would build on and extend the existing strengths and resources of the University system. As a consequence of this distinctive mission, the College has created high quality academic programs that increase access for students unable or unwilling to study on campus; it has responded to individual student purposes as well as to emerging social needs; and it has done so at reasonable cost. ESC has consistently been on the leading edge of innovative program development, pioneering work in mentoring, the use of learning contracts, the evaluation of experiential learning, and distance learning.

By and large, the students who seek such alternatives are adults; consequently, the average age of Empire State students is 37. 10,000 students study at ESC in any one year. 87% have full-time jobs, and a large majority are married. 16,000 students have completed degrees during the last 19 years. Already employed in business, industry, government and labor when they come to us, most ESC students remain in New York State after graduation. More than half of all ESC graduates go on to graduate school.

Unique Features of ESC's Program

Many adults who would like to attend college and whose careers would benefit from college participation do not do so because the "balancing act" consisting of job, home and community responsibilities is simply too difficult. At ESC, students work one-on-one with individual faculty mentors through guided independent study and flexibly scheduled meetings. ESC provides instruction in this way in order to minimize conflict with students' employment and family responsibilities.

Rather than bring the student to a single location, Empire State instead brings the College to the student. The College has established a network of learning centers in more than 40 locations across the State of New York. Students who choose not to travel to a campus to attend classes now have the opportunity to achieve an associate, a baccalaureate or a master's degree within or close to their communities. Eleven academic and professional areas are offered including business, human services, science and technology, and the full range of the liberal arts.

A key feature of ESC's unique mission is to utilize existing resources rather than duplicate them. ESC faculty identify which studies or courses students need in order to complete a degree and link them with instructional resources that may be found anywhere. For example, ESC does not have its own library but rather directs students to the libraries of the State University, private institutions and the public library systems of the State.

By building an academic program around what is available, the College is rarely faced with accumulating obsolete equipment or outdated

materials; its strategy is to be constantly mindful of the existence and source of the most up-to-date resources. Such a strategy is inherently cost effective since it minimizes the need to develop large instructional budgets--e.g., library holdings, laboratories. Empire State's strength has been to identify, access and utilize a vast array of learning resources, not to create them. The fact that ESC is not limited by its own resources makes it a dynamic institution that can respond quickly to emerging social needs.

ESC's Computing Environment

Empire State College has developed its academic computing program in response to this distinctive mission. In 1980, the College began to purchase microcomputers as a cost effective way of developing academic computing at its 40 locations. Since then, we have seen the steady growth of microcomputer use by faculty and students. The College currently owns about 400 microcomputers. Almost all full-time faculty have computers on their desks; students access computing in resource rooms at our regional sites and from their homes and offices.

In 1986, the College installed a VAX 11/750 to serve as a communications link for faculty and students via dial-up access. Current applications include file transfer, electronic mail, bulletin boards and computer conferencing.

Empire State's administrative computing system, housed on the State University's central IBM 3070 in Albany, is linked via terminals and leased lines to our major regional sites. Prior to 1989, ESC's computing support structure consisted of a relatively large data processing department (7.0 positions) to support administrative computing and a small (1.0 position) academic computing/office automation staff to support faculty and students as well as all office automation applications. The data processing department reported to the Vice President for Administration; the microcomputer support person reported to me in my role as Assistant Vice President for Academic Affairs.

Three years ago, the College President reassigned the responsibility for administrative computing and its support staff to me as one means of correcting the balance between academic and administrative computing. A major goal of mine has been to reorient and restructure our computing support staff to create an integrated support structure that more accurately reflects the College's needs.

Impact of Networking Technologies

At ESC, we believe that integrating networking technologies into our academic program is essential to improving access to and the quality of the collegiate experience for placebound adult students. Modern telecommunications and information technologies are freeing both students and faculty from the confines of physical facilities, allowing them to access learning resources from great distances as if they were in the same building. A key feature of these media is that they may be used asynchronously--that is, they allow people to interact with one another at a time and place most convenient to them.

Among institutions of higher education, ESC is particularly well suited to employ networking applications for several reasons:

- The heart of ESC's institutional philosophy is that education need not be confined to a particular physical location.
- ESC has pioneered in developing opportunities for individualized learning through programs not bound to specific campus locations.
- ESC has fashioned a delivery mechanism allowing students who need flexibility of schedule and location to obtain a high quality education.
- ESC's experience in working within an innovative framework with non-traditional clientele has placed the College in an ideal position to advance to the next level of delivery technology.

Thus, computer networking is a natural extension of ESC's mission. ESC has already broken from the physical constraints of campus facilities; now the technology exists to make off-campus learning more productive and more effective than heretofore possible. Networking technologies complement and extend the unique instructional strategy of the College; their integration provides a model for the organization of collegiate learning in the future.

A recent (1988) ESC study of student interest in educational technologies revealed broad access to the requisite hardware. In response to a question asking if they owned or had access to equipment that they could use for ESC study, 94% of the students replied yes for audio cassette players, 90% for video cassette recorders, and 61% for microcomputers. Access to modems, at 17%, was the only potential concern.

Since that survey, ESC's regional sites have been equipped with computers and modems. In addition, most public libraries have computers for public use, some with modems. ESC students may also, with prior arrangement, use computer resources at most of the 64 colleges in the statewide system.

We are also convinced that the relative lack of modems presents no real barrier. Over twice the number of students who said they had a modem indicated they would take a course, if appropriate to their studies or interests, that required a modem. This finding argues for the position that students will secure modems, as they secure texts, when it is in their educational interest to do so. To encourage student involvement in computer-mediated communication, the College will initiate a modem loan program in early 1991. We project that in three years 80-90% of our students will have access to a computer with modem and that access can be secured for any other student who needs a computer for ESC study.

The ESC/SUNY Center for Learning and Technology

In response to institutional readiness on the one hand and student interest and demand on the other, the College recently decided to create the ESC/SUNY Center for Learning and Technology (CLT). It is important to note the word "and" in CLT's title because the Center is not intended to be a learning technology unit (a computer lab, for example, or television studio). Rather, its purpose is to serve as a locus of activity to support the development and use of learning alternatives for students and to support faculty activities involving the application of technologies.

To emphasize its academic perspective, CLT is part of the Office of the Vice President for Academic Affairs and is subject to oversight by a faculty advisory committee. CLT is supported by a combination of internal reallocation of College resources and seed money from a universitywide venture fund established by SUNY Chancellor Bruce Johnstone. Its establishment will accelerate the College's development of technological applications.

In its first year, CLT is exploring what appear to be the following benefits of using telecommunications technology:

- Increased peer interaction among students via computer networking.

ESC has always recognized that what is gained in the flexibility of independent study may mean a loss in the support and stimulation that come from peer interaction. Asynchronous technologies provide the means to put students in contact with one another--enabling them to test their ideas in a scholarly community--without requiring travel or scheduling.

- Increased opportunity for student-faculty interaction.

Although ESC has brought the campus to the student, its program has been based primarily on face-to-face meetings at regional sites. Consequently, a student in Plattsburgh wishing to study with an ESC faculty expert in Rochester, for example, could not do so in the past. Thus, students had access to only a fraction of ESC's statewide faculty.

Networking allows students to communicate with faculty across the state. Faculty who might otherwise be unavailable because of time or distance constraints can now lead remote classes or independent studies. The best person for the instructional task can be chosen regardless of location, increasing both educational quality and productivity. This networking model allows cost effective access to a wide array of faculty resources. Using national networks such as BITNET, students and faculty will also have access to a national and international audience of academics.

Computer messaging allows increased academic support for the independent study mode of instruction. Personal contact between mentor and student can be expanded. Faculty create "electronic office

hours." Students transmit work and ask questions of faculty, asynchronously and on-line via split-screen commentary. Previous experiments with computer-mediated seminars convince us that many of the social experiences of the classroom can be achieved electronically. CLT's projects, therefore, will include a significant level of computer-mediated communication.

- Increased student and faculty access to non-classroom learning resources, particularly libraries and data bases.

As noted above, an important part of Empire State's mission has been to utilize existing resources rather than duplicate them. Telecommunications technology enhances one's ability to access learning resources such as libraries and data bases. In addition, the technology itself can be exploited to support the users of these and other mediated resources.

Staffing of the Center for Learning and Technology

The staff of the Center for Learning and Technology consists of four professionals who report to me. Their relationship to the Office of Computer Services (administrative data processing) is a parallel and cooperative one. My tasks are to identify priorities (planning) and allocate resources (budget), appoint and evaluate staff, manage cooperation among CLT staff and with Computer Services staff, and to focus CLT's activities on achieving our strategic goals.

- User Support Coordinator (USC)

Providing technical support to all College microcomputer users, with special responsibility for faculty, is the central responsibility of the User Support Coordinator. A former programmer/analyst in ESC's Office of Computer Services, the USC coordinates purchase, installation and maintenance of microcomputer products in both their standalone and telecommunications capacities. The USC advises faculty about existing system capabilities, the feasibility of system modifications and the potential for adapting particular media and hardware to meet learning objectives. He "customizes" PC and VAX applications for use by ESC faculty, staff and students to improve their accessibility and effectiveness.

- Training Coordinator (TC)

ESC shares with all colleges and universities the need for a substantial training program to develop faculty and staff skills in using computing and telecommunications technology. While many of our faculty are able to see the potential for integrating these technologies into the academic program, they have been stymied in doing so because they lack basic skills in how to use them.

Based on a collegewide needs assessment conducted in relation to CLT's strategic goals, a systematic training program to move our efforts forward is being developed by the Training Coordinator. This program includes training in basic telecommunications and computer skills such as word processing, file transfer, use of electronic mail, electronic bulletin boards and computer conferencing; use of computers in applications particular to the ESC academic program (e.g., learning contracts, degree programs and individual learning resource libraries); and use of telecommunications technology to access libraries and external data bases. The TC also prepares user support materials, including system documentation, guides and manuals.

- Learning Resources Coordinator (LRC)

The Learning Resources Coordinator provides ongoing advice, consultation and support to College faculty regarding the acquisition, development and utilization of video-based and computer-assisted instructional materials. To support these efforts, she is collecting pertinent journals, books, manuals and trade publications, and she is developing a data base of software and other mediated instructional resources owned by the College. The LRC also identifies and secures access to the electronic resources of external institutions and networks. In CLT's first year, the LRC's primary task is to develop a collegewide electronic library access program. Information about all of these resources is provided to faculty and students through CSOURCES, a VAX-based bulletin board.

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- Coordinator of Faculty Development

An ESC faculty member is spending a year on reassignment to CLT to lead our faculty development efforts. This leadership is expressed in several ways. First, he is coordinating a variety of individual faculty projects utilizing technology in the academic program. These projects, described below, are the central focus of his work. Second, he is developing, implementing and evaluating a model multi-media learning experience integrating computer conferencing, video and distance study--i.e., he is leading by example. Third, he is committed to collegewide communication, an essential ingredient to the success of CLT. This communication is two-way: he serves as a "voice of the faculty" by brokering technical support and resource needs to CLT staff, and he informs the general college community of the progress of CLT's activities through internal publications and communications systems. Finally, he is seeking external funding to develop, implement and maintain technology mediated learning at ESC. For example, he and I collaborated in developing an Annenberg/CPB grant and, while the grant was not funded, ESC was a finalist and will participate as an Associate in the New Pathways to a Degree Program.

CLT's Strategy: Focus on Faculty

The central strategy of CLT is to focus its activities on faculty development. Our guiding themes are "Planning, Service and Visibility." We have created a monthly newsletter which we distribute to all ESC faculty and staff, students who elect to receive it, and persons outside of the College who wish to be kept informed of our activities.

The CLT Venture Fund

CLT has established its own Venture Fund to support faculty who wish to develop applications of instructional technology. Providing modest, but largely unrestricted, grants to individual faculty to acquire and test media (primarily software and videos) for use as learning resources, the Venture Fund is currently supporting 13 projects. Underway are experiments in remotely accessed computer assisted instruction; mathematical toolbox software in advanced applied mathematics; studies in finance using videotapes; computer mediated laboratory simulations in biology; and teaching writing at a distance using terminal capture software.

Response to this program has been very positive: in its first year, 10 percent of the full-time faculty applied for funding. Grantees are obligated to prepare written evaluations of the media and analyses of potential application across the College. CLT's Venture Fund responds to individual faculty interests while benefiting the whole College community with their findings.

The Technology Mediated Learning Project (TMLP)

The Technology Mediated Learning Project (TMLP) is a faculty-centered initiative intended to bring together the more technologically sophisticated faculty to develop collegewide, collaborative faculty demonstration projects. As the technology competency level of the general faculty increases, so will the numbers who will want to participate in this faculty development effort. Similarly, as student competency grows, so will the demand for technology mediated learning opportunities. If TMLP is successful, it will provide a model of the way to support the on-going academic program development and implementation efforts of the faculty.

An important outcome of TMLP will be the further definition of appropriate technological applications that are relevant to ESC's mission, students and curriculum, that are cost effective, and that improve the quality of educational practice at ESC.

Focussing on faculty development, TMLP's goals are to:

- promote faculty understanding of technologies and their application to learning;
- assist faculty to develop and implement technology mediated learning experiences;
- provide a forum in which academic, pedagogical and technical knowledge and experience can join to provide resources for developers;
- identify gaps in resources, experience and knowledge;
- examine, test and implement alternative pedagogies required by, supportive of, and/or associated with technology mediation;

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- evaluate both the development and implementation of applications for students and faculty;
- demonstrate successful experiences; and,
- increase knowledge and improve practice in adult and technology mediated learning generally through contributions to the literatures of these fields.

The Hyper-Seminar

Two projects illustrate the type of activities being undertaken by TMLP participants. Both are what we call "hyper-seminars." They are intended to bring together, electronically, students and faculty throughout the College who are engaged in similar studies or who share academic interests. They also make available to students and faculty "guest speakers," outside experts, without regard to place or time. Each hyper-seminar includes a "snack bar" for informal discussion, "office hours" in which students can address questions to specific faculty, a "library" for sharing comments and ideas on books and other resources, and a means for students to "talk" privately.

The first hyper-seminar has been designed around the PBS telecourse *Discovering Psychology*. Students across the State are enrolled in an introductory psychology study in a variety of ways--through mentored independent study, through study groups, through a distance learning course--using print and video resources. With the video programs as a focus for discussion, participating students and faculty are brought together electronically in an electronic seminar much as they would do physically on a campus.

The second hyper-seminar, an advanced level study in economic policy, is scheduled for implementation in early 1991. Most ESC students pursue their degree programs through independent studies which they design and complete with an individual faculty member. Students participating in the hyper-seminar will continue to work independently, but they will also be engaged in a seminar, as well as in informal contact, with students across the College who are studying economic policy. One faculty member will lead the seminar, and experts from within and outside of the College will be brought in to contribute to specific topical discussions.

Other TMLP projects include a distance learning course, "The Constitution and Public Policy," a multi-media learning experience that integrates computer conferencing and the Annenberg series *The Constitution: That Delicate Balance*; an English composition course called "Writing for the 21st Century" that uses computer conferencing to incorporate collaborative pedagogy in the writing process; an electronic seminar on artificial intelligence; and an interdisciplinary, computer-based course, "The History of Business," team taught by two faculty from history and business.

TMLP's Relationship to CLT

While CLT is responsible for collegewide technology support, support for TMLP activities is a priority. CLT staff assist TMLP participants in areas such as resource identification and acquisition, extramural systems interfacing, application design and analysis, instructional design, and applications training.

The relationships between CLT staff and TMLP participants mirror and anticipate the relationship between CLT and the College faculty at large. TMLP provides an intensive and focused opportunity for CLT staff to understand faculty needs and visions versus ESC's resource and systems capacities. At the same time, TMLP provides a similar opportunity for faculty to become sensitive to the uses and misuses of the CLT resource. The early, close working relationship of CLT and TMLP will serve to define the future relationship between CLT and the faculty as a whole.

Accessing Libraries Electronically

CLT is developing a library access program to provide the capability for all ESC faculty and students to access all on-line public access catalogues in New York State. Adult students find it both difficult and time-consuming to travel to libraries searching for reference materials. Establishing electronic access to libraries will remove the physical barriers to library access, thus increasing library usage.

In addition, we plan to enable faculty and students to incorporate use of encyclopedic data bases into their programs of study. Databases such as DIALOG and BRS offer computer searches, bibliographic citations and abstracts of the material. Electronic access to both kinds of bibliographic materials will increase the quantity of materials available to off-campus students as well as enrich the quality of their studies.

Creating a Demonstration LAN with Help from AT&T

ESC has received funding from AT&T's University Equipment Donation Program to establish a local area network at our Regional Center in Rochester. This is the first phase of a development plan leading to the creation of local area networks in our largest Regional Centers. The Rochester LAN will serve as a demonstration site for the rest of the ESC community and provide us with the experience needed to implement the full plan.

The LAN consists of a STARLAN network connecting faculty PCs for file sharing, database access, printer and disk sharing; synchronous and asynchronous gateways to ESC's VAX and IBM 3070 applications; local electronic mail via AT&T Mail; remote PC access support to allow distant faculty and students to function as if physically connected to the LAN; FAX servers with scanners and printers to provide FAX communications to and from LAN clients and remote locations; and X.25 router hardware and software for bridging multiple Regional Center LAN's so that they appear as one large LAN.

ESC: A Model Institution for the Information Age

While many of our applications of computing and telecommunications technologies are in their early stages, it is clear that the College is gaining valuable experience in using them to enhance its academic program. What we have achieved thus far has been possible primarily because our existing structure and pedagogy has made the adaptation of these technologies a natural extension of our academic program. We believe that ESC has the capability of becoming a leading innovator in the use of instructional technology and that our experiences can be shared with and adapted by other colleges and universities as well as by any organization that operates in a dispersed environment.

It has become commonplace to observe that we live in an information age. The volume of available information, in a growing array of formats, increases exponentially each year. Scientific and technical information alone doubles every 20 months whereas 30 years ago it doubled every five years. No single person or group of individuals is capable of assimilating all the available information or of keeping abreast of new information as it is generated. Similarly, no university and no library can hope to meet the instructional and research needs of its students and faculty by itself. Cooperation and sharing is required for campuses committed to a "rich information infrastructure" to support both student and faculty needs. New models for delivering higher education are needed to respond to these significant societal changes.

Empire State College has demonstrated that it is not necessary to have a campus in order to have a college, that a high quality education can be provided by networking people to people and people to resources. We know that the integration of computer networking will exponentially increase the effectiveness of our distance learning methodology. We are committed to meeting the challenges of the information age, and we are confident that we will succeed.

[I wish to acknowledge the staff of the ESC/SUNY Center for Learning and Technology for their contributions: Bob Perilli, User Support Coordinator; Larry Greenberg, Training Coordinator; Lora Montague, Learning Resources Coordinator; and, especially, Lowell Roberts, a mentor in ESC's Center for Distance Learning who leads our faculty development efforts. This paper is a product of our collaboration.]

Information Access
Computing Services and Libraries: A Joint Offensive Team

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Abstract: Access to scholarly information, now available in a variety of mediums, is essential to the evolving instructional and research efforts at universities. A joint approach to these issues by Computing Services and by the Libraries at the State University of New York at Binghamton has provided new avenues of access to data resources and bibliographic materials.

This paper describes several areas of cooperation:

1. Early 1980's access to the card catalog and circulation information through the campus network.
2. Present data access to resources such as Compustat, ICPSR, and CRSP funded and managed jointly.
3. Present access to regional and national library resources from the campus network over the national research networks.
4. Cooperative project to link catalogs with the three SUNY University Centers via NYSERNet.

A new general campus information and access menu has been implemented at Binghamton to present the library public catalog, to allow access to commercial databases, and to provide access to other University information. Studies are now underway to provide access to CD-ROM based materials via the campus network, to provide automated access to services such as inter-library loan, and to explore the impact of digital imaging technologies.

I. A Historical Look

The library was an early participant in the emerging computing technologies on campus with the introduction of machine-readable cataloging records developed in the mid 1960's. As part of this evolution SUNY-Binghamton joined OCLC and subsequently the Research Libraries Group to allow cooperative cataloging and inter-library loan using private vendor-specific networks. Later the advent of Dialog, BRS, and STN led the Library to begin to offer online searching services.

In addition to these original systems (which were largely batch computing applications providing circulation listings and shelf lists) one of the earliest campus networks existed between the library and the computer center. It supported a punched card circulation system. Librarians inserted a pre-punched ID card into a system reader that signaled a punch card device in the computer center which produced a card image record of the transaction. These cards were run nightly to provide circulation listings and maintain a simple database of holdings. This primitive network taught us several important principles about real-time services and paper backup systems.

As the costs of computing hardware began to drop and other costs such as library support staff and library acquisitions began to rise, a turnkey minicomputer system was acquired to automate some library functions. At Binghamton a GEAC 8000 was installed that provided an online catalog (OPAC) and circulation control. Initially this system was a satisfactory cost containment solution but within four years its resources were seriously strained and future growth was limited.

II. Current Status

To expand library resources during the late 1980's Binghamton decided to move library automation functions to the university's large IBM 3090 mainframe. Before migrating to this mainframe several minicomputer options were considered. Dedicated minicomputers could not meet the performance and data storage requirements identified at Binghamton. It was essential to select a system with sufficient capacity to fully integrate library functions including circulation, catalog access and acquisitions as well as offer common software for clients to access multiple information resources such as commercial databases.

The major issues involved in the mini to mainframe computer transition included:

- RFP and contract
- Funding and support
- Planning
- Implementation

RFP's and contracts for Library systems can be multi-year projects. At Binghamton we were fortunate to participate in a multi-campus RFP with SUNY-Stony Brook and SUNY-Buffalo to acquire a mainframe-based software which resulted in the NOTIS product. The prices obtained in the three-campus contract saved the campuses and the State a considerable

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amount of money. The potential savings provided the impetus for the three campuses' libraries, computing services and administrations to work together in acquiring funding and support for the next generation system. It also provided a framework for future joint development projects.

Once the contract was signed the implementation project took almost 13 months to complete (April 29, 1988-May 22, 1989). Several significant tasks involved the re-wiring of the Libraries, conversion of bibliographic, item, and patron data and staff training. A key to the project's success was the hiring of a permanent systems librarian to serve as project manager and the assignment of an assistant director from Administrative Computing Services to the implementation project.

There has been general agreement at Binghamton about the importance of Administrative Computing to the success of the project. Libraries are usually considered academic agencies but have much more in common with administrative agencies. Functions such as inventory control, personnel and user files, overdue notification and billing are applications where administrative computing has the experience and the natural organizational responsibility to integrate library requirements with other institutional databases. There was a wide level of Library staff participation in the implementation of the new system. Staff contacts between Library and Computing Services helped make the transition a positive experience for both parties.

III. Linked Resource Databases

Providing online access to the Library's book collection was only the first step. Although a large portion of the information needed by students and faculty are contained in journals, these were typically indexed only in print media or on expensive CD-ROM, or connect-time oriented systems such as Dialog. As a result one area for library automation often identified by users was online journal indexing.

CRSP and COMPUSTAT datasets were early model of information resources purchased as part of library holdings, with funding support from the Provost. Usage involved support from both Libraries and Computing Services.

In late 1989 a Library task force, with the aid of Computing Services, undertook a study of database systems that would complement the existing online catalog. This culminated in the selection of the NOTIS multi-database software and the H.W.Wilson Indexes as the first online database.

During the implementation stage of the multi-database software, product site license restrictions necessitated the development of a front end to the Library system that would limit database access to members of the SUNY-Binghamton University community. Today this front end software supplies nonport-specific access to university members; book and journal citations are now retrievable from all areas of the campus. Additionally, this in-house software also provides Binghamton with a solution to controlling keyword/boolean searching;

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CPU resources required for these searches are protected by limiting the number of simultaneous searches.

IV. The Next Frontier

A. Linked information systems over national networks
B. Workstations, multiple sessions, and X-windows

Libraries today are faced with increasing pressures of cost and space as the amount of published information multiplies. To alleviate these pressures librarians are beginning to look to electronic methods of expanding access beyond their individual campuses to national electronic information networks. They are relying on campus computing technology to maximize access and minimize costs. The PACLink project now underway at three SUNY campuses and eight Indiana campuses will link end users to multi-campus library resources. The use of the Z39.50 protocol which facilitates information retrieval will ultimately allow wide connectivity by the method of separating the search query from the search engine software. SUNY librarians see PACLink as a necessary step towards greater collection sharing.

Library systems are large "information servers". For librarians at Binghamton there are already several servers available both on and off campus. To facilitate the use of these systems reference librarians must have appropriate access along with library patrons. Currently a study is underway addressing a design for a "Librarian's Workbench" (see Fig. 1). Using X-windows and an appropriate workstation a reference librarian will open several simultaneous windows when assisting a library patron. Multiple catalogs on several campuses can be searched in separate windows and Inter-Library Loan (ILL) forms can be completed in another window. The application can even include scanning the patrons library access bar code. Other librarians will use similar workbench screens to process acquisitions, handle fines or read their own electronic mail. Placing new tools on the librarian's desk will necessitate an update to the wiring plan in the library. In addition, support for foreign language character sets, and various analysis tools such as LOTUS 123 and SAS will still be required.

V. Not Just the Online Catalog

Establishing the online catalog and its associated facilities is only the first step in the joint efforts of libraries and computing services. Several other projects requiring cooperation include:

A. microcomputer facilities in libraries
B. CD-ROM and LAN development
C. multi-media applications
D. Telefacsimile, OCR, and Image technologies
E. University ID systems
F. Database of software titles
G. Full text applications

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Librarian's Workbench

X-WINDOWS

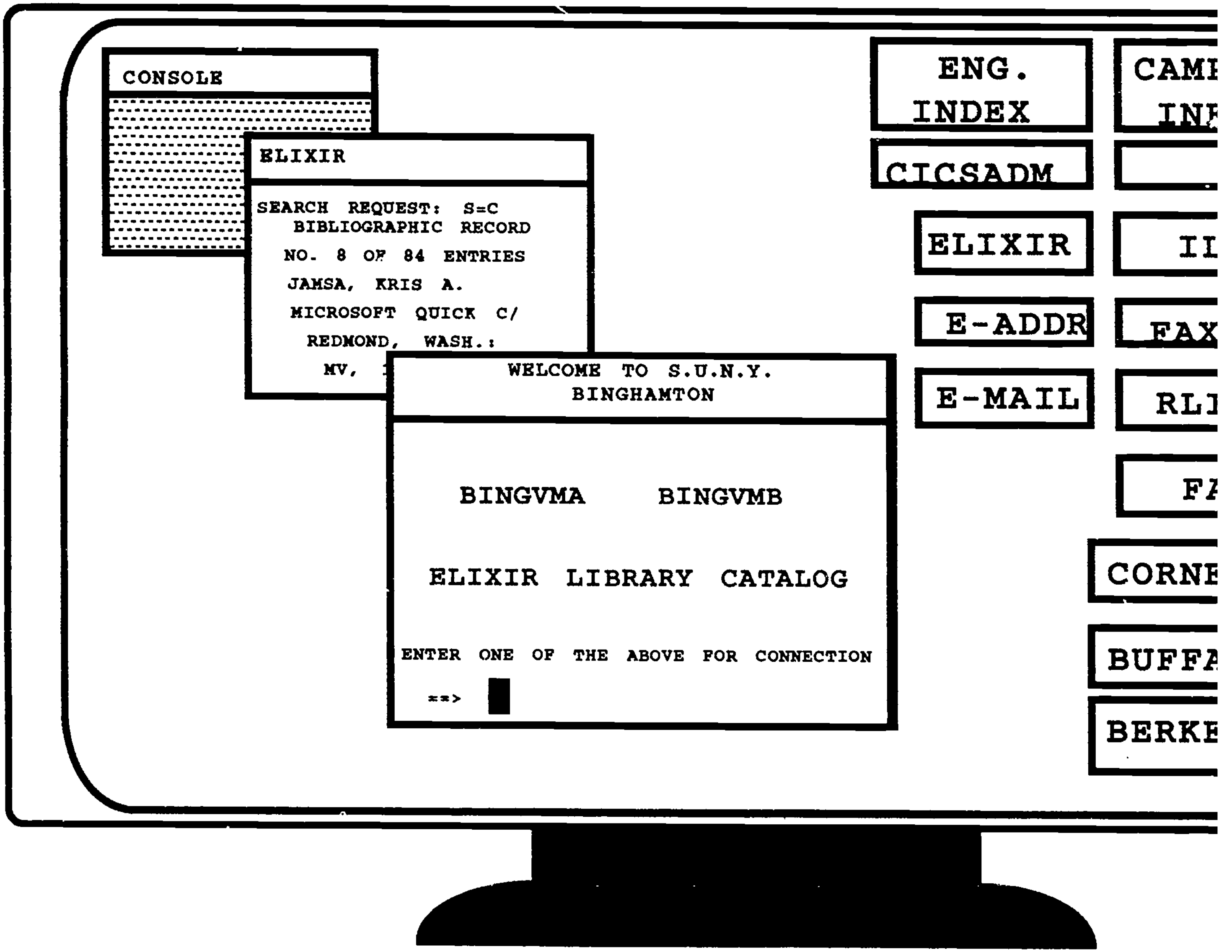

Fig. 1

VI. General Conclusions

1. The library will become the largest user of computing resources on campus. Binghamton's experience has shown that since the move to the mainframe searching has increased 50% in one year. On a moderately busy day our library's usage tops 52,000 CICS transactions. October 1990 statistics show almost 1.5 million CICS transactions for the library system (see Fig. 2).

2. The library will consume all the disk storage money can buy. The wealth of available databases creates an endless appetite for mainframe storage. A joint plan between computing and libraries will help insure that disk space is available when new information resources are purchased.

3. Once the library is on the campus network and the Internet, many new users from off campus will use your system, particularly if it has superior performance or enhanced capabilities. Oddly enough these users often search the title on remote automated systems in order to find the book in their own libraries.

4. Things Librarians Overlook

- performance factors
- backups
- wiring
- concept of band width
- maintenance and support

Librarians need the help of computing professionals when evaluating new systems. A Librarian's typical response to systems planning is to appoint committees that focus on system features. The importance of load testing and performance factors are often overlooked. Confusion between the capabilities of mainframes, minicomputers, and microcomputers is also common. A good joint offense will result in improved resources for the entire university.

5. The organization of the University Computing Services is critical to the success of library automation.

Organizational "Pluses" from the Library Perspective:

- Library is supported by Administrative Computing (although often considered an academic department, the Library has more in common with administrative functions).

- Academic computing/administrative computing are departments within the same Computing Services organization.

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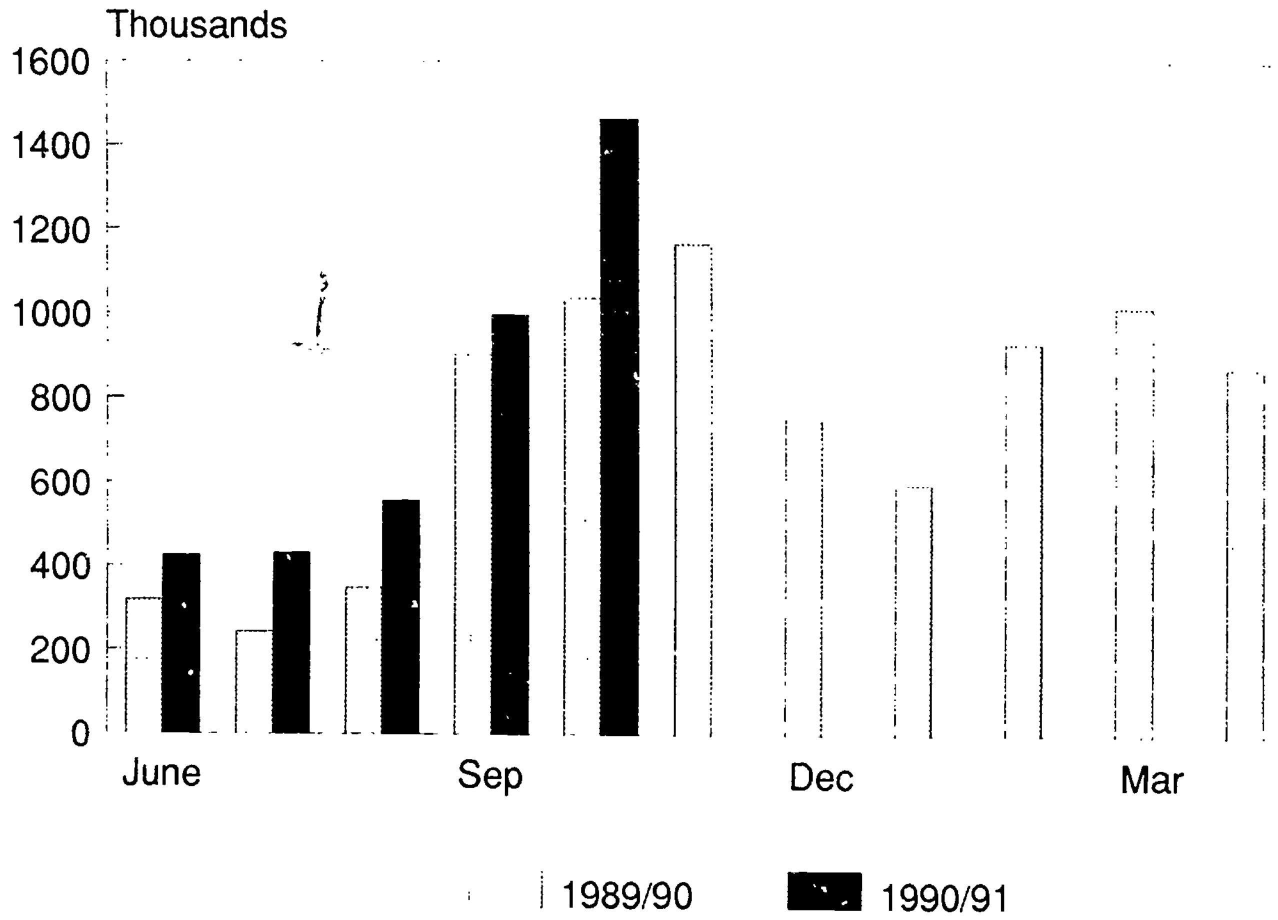
SUNY Binghamton Libraries
Monthly CICS Transactions



CAUSE90

Fig

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- Computing Services and the Library report to different campus Vice Presidents. When the Library and Computing Services get support from two VP's, things happen!

Library computing applications on campus are extremely relevant to new directions in today's computing field. Concepts such as "knowledge navigators" are on their way to becoming reality. The theme of "information at your fingertips" and the facility to retrieve and organize information is where much development is currently occurring. Enhanced library support as a campus priority will insure an improved educational experience for students and greater productivity for researchers.

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From Segregation to Integration: Effective Planning and Implementation of Academic Information Systems

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The isolation of administrative information systems from academic systems has segregated essential institutional data which could be used to further the academic mission of the university or college. Through integration of systems across diverse technology platforms and opening access to institutional data, Indiana University has begun to expand the concept of Academic Information Systems. This paper describes the evolution of Academic Information Systems and the forces behind that evolution, portrays the Academic Information Systems planning and implementation process currently underway at Indiana, and makes the results of this planning generalizable to any university or college.

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Academic Information Systems: What Are They?

There are many kinds of resources which are of vital importance to support the academic mission of the college or university. Certainly financial resources, human resources and facilities are critical and limited, and in most cases these resources are shared between various departments and concerns to provide optimal effectiveness.

Libraries are being told to increase inter-library loan activities rather than increase their acquisitions budgets. Academic departments are being asked to scrutinize their classroom activities and take on more with less available resources. Administrative departments are being closely scrutinized to identify areas which can be cut or merged to squeeze more resources for use elsewhere in the University. The push to spread diminishing resources as far as they will go will continue as the anthem for higher education in this decade as we all face shrinking budgets, increased costs and diminishing student enrollments.

During these times, we need mechanisms to help us record, measure and analyze our activities and provide access to information which is critical to our respective missions. The registrar needs to provide up to the minute enrollment information. The library needs to provide an effective on-line catalog and access to specialized databases. The financial management wing of the college or university must provide usable tools to let departments manage their resources effectively.

In all cases, we not only need to build better systems for independent areas, but also must construct systems that can assist us in furthering cooperation between the interdependent units of the university or college. Automated information systems which have historically been viewed as strictly administrative, are now of growing interest to academic units who are developing strategic and financial plans for the next decade. Many academic units are discovering "closets" of information and associated systems which have historically been isolated from all but those who directly maintained them. These discoveries are expanding the role and definition of what has been traditionally called Academic Information Systems.

In Indiana University's evolving Academic Information Systems (AIS) plan, an Academic Information System is defined as involving "the identification, delivery and interface between academic, administrative and institutional data and applications, both those which originate inside and outside Indiana University." The plan further stipulates that AIS should provide a way to interweave departmental, institutional and external information and resources in a coherent and easily used way. Academic Information Systems should not be restricted to a given computing hardware platform and should invite and enable collaborative efforts among the various information providers (the academic and administrative departments) and the service agencies (computing centers, telecommunications, etc.).

An Academic Information System should provide not only a vehicle to some other destination, but should be a destination itself. In the same way that a cafeteria offers both "a mechanism to access" a food item and the food item itself, an effective AIS should provide both process and content.

Traditionally, we have built elaborate menus on mainframe computers with logical tiers and hierarchies which must be navigated to gain access to the information or tool of choice. This approach lends itself to the novice user who might need extensive hand holding while they gain familiarity with the system, but over time becomes an impediment when the user wants to gain access to a function which lies five or ten layers deep in a series of menus.

In order to be truly effective, AIS access mechanisms need to be provided through the user's local desktop computer of choice. Users are likely to be more familiar and comfortable with this device than they are with the remote mainframe. We need to allow the user to tailor the service choices and access mechanisms to their own changing requirements rather than produce systems that are designed for anyone who might need access to anything.

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Academic Information Systems: Defining the Needs of Academic Users

At one time, Academic Information Systems only provided a framework to gain access to basic tools such as electronic mail, bulletin boards, and textual data. Academic end users' needs greatly expanded beyond these boundaries, particularly with the advent of on-line library services and the desire to integrate these services with other remote systems and local data files. In addition, academic units now need to gain direct access to information about enrollments, student demographics, grant balances and departmental budgets, rather than solely depending upon other campus agencies to provide this information.

During the late 1980s, a variety of constituent groups at Indiana University began to articulate these needs in the form of specific proposals. For example, the Online Database Forum, made up of representatives from the libraries, computing centers and a variety of academic disciplines, has expressed the desire to support access to numerous local and remote specialized databases and indexes. And a committee made up of faculty, Registrar's Office staff, and University Computing staff developed plans for on-line access to class rosters.

Impediments to Addressing Academic Information System Needs

In the past, university information systems were primarily directed towards a given department or discipline. In most cases, these systems were designed to automate manual procedures and, as a result, did not lend themselves to a general audience. Even if a system was generally well developed for users who were external to a given department, there was still considerable difficulty in gaining access to the system if it resided on a different computer or network from the one the client was primarily using.

There were also differences arising from how administrative versus academic computing centers viewed the services that should be provided. The administrative computing approach assumed that the user needed a system to be designed and implemented to provide specific, pre-defined processing and static views of data files in a "cradle to grave" support structure. The academic computing approach urged the importance of user self-reliance with an emphasis on providing convenient access to tools and resources. While both of these approaches have merit, neither provided optimal service in isolation from the other.

At Indiana University, academic departments were similarly isolated from potential funding sources for systems which relied upon institutional data (traditionally kept on IBM mainframes). These funding sources were generally targeted at administrative systems. As a result, some of the expressed needs of the academic departments could not be accommodated without the direct involvement of a partner agency (such as the Registrar's Office) that did have access to the administrative system funding mechanisms.

Planning activities for computing at Indiana were also separated by the distinction between academic and administrative units. While a three year plan existed for Academic Information Systems in the academic computing environment, it concentrated on service delivery mechanisms and network dependencies. This plan did not address content issues, access to existing administrative information systems, or access to institutional data resources that existed on the administrative computing platform.

Academic Information System Islands

While segregation of information systems activities and resources characterized Indiana University's computing environment throughout the 1970s and most of the 1980s, certain attempts to bridge the gap were made during the latter part of this period. The Academic Information Environment (AIE) is the Bloomington campus-wide, VAX-based information system which has evolved into an effective information access vehicle. The AIE already incorporates a few of the aspects of an AIS as defined above. The services provided via the AIE range from access to electronic mail and bulletin boards to announcements from various student groups and information on class closings provided by the Registrar (some of these services

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are described in detail below). In order to address the need to provide tailored access to services, the AIE lets the user define his/her own keywords which will bypass the menus and deliver the service of choice.

In anticipation of the on-line catalog, the University Libraries and the academic computing center developed the Library Information and Reference Network (LIRN). This is a subsystem of the AIE and provides a variety of services, including access to remote bibliographic databases, an electronic library reference desk, a way to renew library materials electronically, a mechanism by which library materials may be requested for delivery directly to a campus office, and access to the on-line catalog which is running on an IBM mainframe computer.

The University Service Environment (USE) is a state-wide service presentation similar in many respects to the AIE, but tailored to systems which reside on the IBM mainframe. While USE does not currently provide access to all IBM systems and services, it does enable the use of some systems which are of particular importance to academic constituent groups who have not had access to IBM systems in the past. It is accessible over the former academic network rather than through the traditional SNA network used by administrative computing client departments.

Administrative Systems: Moving Toward Integration

The 1970s and early 1980s were also a period of vigorous growth for administrative information systems at Indiana University. By the mid-1980s a large number of mature, integrated information systems were in place: student records, financial aid, student accounts, human resources, purchasing, and student advising, to mention only a few.

As alluded to above, most systems designed during this period had as their primary purpose the support of some operational or functional area of the university. Unlike systems of a decade earlier, however, the systems of this period accomplished more than the automation of a set of defined tasks. They were, in two important respects, *information* systems.

The systems were characterized by the creation and maintenance of large information repositories, providing a rich aggregation of information resources which were available to support the system itself and to support other management and analysis needs of the institution. These systems were also characterized by on-line data maintenance and on-line data access as their primary means of interaction with the user. The users of these on-line systems were, in most cases, information specialists -- either staff in the primary user office itself (the Registrar, the Bursar, etc.) or specially trained staff in one of the academic or academic-support units (professional advisors, academic deans, etc.). For these users at least, delivery of information had become an important system design criteria. These two factors -- the assembly of a rich information resource and the initial steps toward information delivery as an essential system feature -- provided the foundation for the changes in information systems the university has seen in the last five years.

An important stimulus for the change that occurred was the realization on the part of several administrative departments that they could, and probably should, expand the client base for their information delivery systems from a small number of information specialists to the entire university community of students, faculty and staff. The computer literacy movement of the mid-1980s and the grassfire of PC installations that spread across the campus (fanned by educational discounts and a university commitment to departmental computing and student computing) made this realization almost unavoidable. The result was a change in thinking, a paradigm shift from information systems for the "information elite" to information systems as a public service.

Administrative Systems: Early Efforts at Integration

Beginning in 1986-87, some early steps were taken by administrative units at Indiana University to provide true "public service" information systems to the university community at large. The first of these were simple information display systems, similar to public bulletin boards: Human Resources brought up a weekly Job Posting bulletin; the Registrar implemented a daily Closed Class Listing set of bulletins. In its earliest incarnation the Registrar's Class Listing system was implemented on a departmental PC, using a low-speed modem and public domain PC bulletin board software. Later, this and the Job Posting display were integrated into the VAX-based Academic Information Environment (AIE) described above.

Based on the success of these initial efforts and the positive response received from students and faculty, more ambitious plans for public service information systems were developed. Early in 1989, the Registrar implemented an Electronic Class Roster delivery system for faculty. For some time faculty had been taking paper rosters distributed by the Registrar and key-entering selected data from these into local databases on personal or departmental computers. This new system offered faculty the option of receiving class rosters electronically, delivered via the campus e-mail network. Rosters were delivered to faculty according to a pre-defined schedule: approximately once every two weeks during the semester. In its first semester, the system had 180 faculty users in 35 departments; in the second semester, the numbers were 250 users in 45 departments. A survey of faculty found the system had a 93% approval/acceptance rating. The system was enhanced in 1990 so that faculty users could request rosters from their workstation or terminal on an as-needed basis, rather receiving them on any fixed schedule.

Early in 1990, the academic advising units and the Registrar implemented a student-oriented presentation system for the university's on-line advising system. This system extended the capabilities of the DARS advising system (purchased from Miami University) by permitting each student the ability to access his/her own academic record and advising report from any terminal or workstation connected to the campus network, or from any personal computer equipped with a modem. Selection menus guide the student through the system, providing options to view the complete academic record, check progress toward a degree, experiment with alternate degree programs or the effects of possible future registrations, and update the Personal Identification Number which provides record-level security for each student's academic data. Similar efforts to these have also been made in the financial systems area, where expanded access has been offered to the on-line purchasing system and the on-line statement of account display system.

Administrative Systems: Discovering New Needs

These early experiences pointed up a number of differences between public service information systems and their more traditional counterparts. In the *design* of traditional information systems, the designer has the opportunity to meet face-to-face with the system users -- possibly a representative sample of management and front-line staff who will use the system or, in some cases, with the entire population of eventual users. Public service systems at a large university are designed, not for dozens or even hundreds of users, but any of several thousand potential users. And since use of a public service system is entirely a matter of choice for the user, finding a truly representative sample of users before the system is implemented is extremely difficult -- a situation which seriously hinders the traditional process of gathering user requirements.

A mature set of practices and procedures are in place for the *support* of traditional information systems -- user documentation, on-site user training, expert hot-line consulting, timely notice of system changes and upgrades, etc. -- all of these practices made possible because the information systems have a defined user-base that is known to the computing support organization. Again, with a large, and largely-anonymous, user population traditional support mechanisms need to be re-evaluated and re-tuned when applied to public service information systems.

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As described above, traditional information systems are typically developed under the sponsorship of the department(s) who will be the system's users. Like most universities, Indiana University has a formal structure in place for the *proposal, review and funding* of systems development projects. While many public service information systems do have a natural sponsor (such as the Registrar for student systems), the traditional process of selecting and prioritizing information systems development cannot work as well when the real end users of the system have little or no voice in the funding process. In particular, because the user-base is so diverse and diffused, there is no focal point around which proposals for *new* public service information systems may be gathered; the end user public must rely on traditional IS user departments to propose or develop new systems and services.

Two other issues were brought into sharper focus through these early efforts. Traditional systems rely on a centrally-administered security process to control access; public service information systems need to find viable alternatives, such as student Personal Identification Numbers or some equivalent facility for faculty, so that security administration does not become a bottle-neck to information access. And second, the movement toward fully public information systems raises questions about the university's policies on access to institutional data; the need for formal policies and guidelines on data administration and access became apparent through this process, again so that over-protection of information does not become an obstacle to widespread access.

The process of identifying some of these emerging issues and working toward their solution was aided in great part by several user/technology organizations and advisory groups. The *Access to University Information Task Force*, made up of faculty and staff, focused its attention especially on the information needs of the academic community and made several recommendations regarding both the desired content of Academic Information Systems and the kinds of delivery mechanisms which should be employed. The highest priority content areas were student, course schedule, budget and account data; the desired delivery mechanisms were a combination of pre-defined or "canned" presentations and some measure of user-driven ad hoc access. A similar group was formed to provide guidance and advice specifically in the student systems area -- the *Registrar Advisory Subcommittee*, a faculty subcommittee of the Academic Computing Advisory Committee. This group was an effective design partner with the Registrar and Computing Services in the development of the Faculty Roster System.

Convergence: Organizational Factors

The convergence of academic and administrative interests which brought attention to bear on the concept of Academic Information Systems as a unique application area came from three sources: a University-level planning process, the restructuring of the University Computing organization and, most importantly, from the grassroots -- the academic and administrative constituents in the university community at large.

At the University-level, an academic strategic planning process directed by IU President Thomas Ehrlich resulted, in Spring 1988, in the publication of *IU: One University - Indiana at its Best*, a strategic plan and academic agenda for the entire institution. Building on this academic agenda, the Vice President for Administration and Finance began, also in 1988, an administrative planning process, one outcome of which was the publication of a *Statement of Administrative Philosophy* which begins with this common-sense, yet critically important statement:

> "All administrative activities are dedicated to serving and advancing the academic work of our students and faculty."

Although many administrative departments had long acted on this philosophy, it had not for several years been so unambiguously stated nor so universally applied. With this statement came a clear priority in the

information technology arena for focusing attention and resources on information systems for students, faculty, and academic staff -- in other words, a priority for Academic Information Systems.

During this same time period, a reorganization of computing was begun at Indiana University. A single computing organization was formed in 1989 from the merger of the university-wide administrative computing organization (Information Services) and the primarily campus-based academic computing organization (Bloomington Academic Computing Services). All units in this new organization, University Computing Services, serve both academic and administrative users. Within this merged academic/administrative computing organization there was formed an application development group with specific responsibility for Academic Information Systems (AIS) development. And while this group served as a focal point for AIS development, the AIS umbrella covers a much larger set of the computing organization's staff and resources. The technology units of networks, workstations, and central computing systems are providing the infrastructure on which Academic Information Systems can be built. The systems development unit, especially the AIS development team, in partnership with the data administration and access group, is working with several user departments to extend the reach of Academic Information Systems.

As important as these top-down organizational factors may have been, the undeniable momentum for Academic Information Systems came from the grassroots. The un-met information needs of the students, faculty and academic staff assured that, under almost any set of organizational circumstances, progress would be made on delivering a new style of information system to meet these needs. The early AIS initiatives (the on-line library catalog, AIE, etc.) and the early administrative system initiatives (the on-line class listings, faculty rosters, etc.) -- and the success of these early efforts -- all but guaranteed that attention and resources would continue to be focused on the delivery of this type of system.

Convergence: Technology Factors and Computing Priorities

Technology factors are closely interrelated with organizational factors in providing the impetus for Academic Information Systems. The convergence of academic and administrative initiatives in turn has provided direction to the University Computing organization in setting its technology priorities.

Among its highest technology priorities, University Computing Services has placed significant emphasis on the installation and operation of a campus-wide and state-wide high-speed network based on the TCP/IP protocol. Although it is not yet ready to fully replace the other networks which had been in place (including SNA for state-wide administrative use and DCA for state-wide asynchronous terminal connections), the TCP/IP network is the backbone on which information delivery to the desktop of students, faculty and staff is being built.

Also among its highest priorities, University Computing Services has envisioned a world which places the user at the center of a rich information and computing environment, and which delivers seamless access to this environment via the workstation. Although many steps are necessary to achieve this vision, its practical realization in the near term will be an extension of the AIS information delivery model to the workstations and personal computers of students, faculty and staff.

Finally, University Computing Services, in partnership with several of its key clients, has adopted a philosophy of information management that says that the value of information as an institutional resource is *increased* through its widespread and appropriate use. The delivery of institutional information through various Academic Information Systems is consistent with this belief; public service information systems which serve thousands or users, rather than tens or hundreds, have the capability of adding significantly more value to the institution through their widespread dissemination of useful information.

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The Joint Academic Information Systems Subcommittee

In order to address the needs and take advantage of the converging organizational and technology factors, and the evolving computing priorities identified above, Indiana University has initiated an end user process for planning the future of Academic Information Systems. This process began in concept almost one year ago with the formation of an Academic Information Systems Subcommittee that is a joint undertaking between the University's academic and administrative computing advisory committees. Before describing this subcommittee and its role, some background on these advisory committees should prove useful.

An advisory committee for academic computing at Indiana has been in existence for at least 15 years, and an administrative computing advisory committee was created in late summer of 1989 as a result of the merger of the administrative and academic computing organizations. The committees are responsible for providing advice to both the University administration and to University Computing Services on user needs, policy directions, planning, and prioritization of budget initiatives. They also function to oversee the activities of University Computing. The Academic Computing Policy Committee is comprised of faculty and students, whereas the Administrative Computing Advisory Committee is comprised of administrators, academic staff, and faculty.

The appointment of the joint Academic Information Systems Subcommittee evolved from a set of advisory committee and UCS staff discussions which took place during the 1989-90 academic year. These discussions were initiated in response to the unmet needs and driving forces that have been identified above. Through these discussions, it was recognized that the concept of an AIS, while quite nebulous, needed to span the traditional distinctions between academic and administrative computing. As a result, both advisory committees agreed to form the joint AIS Subcommittee. One interesting aspect of this subcommittee is that it is the first formal coupling of administrative and academic computing from the end users' perspective. The initial charge for the AIS Subcommittee is to prioritize the development of new projects for IU-Bloomington's Academic Information Environment (AIE), establish standards for the presentation of information within this and other such environments, and develop long-range and annual implementation plans for the AIS area.

The membership of the AIS Subcommittee also helps to reveal its nature. This membership includes high-level administrators, a number of faculty, and a student advisor. The importance of the subcommittee's responsibilities is reflected in the fact that two assistant vice-presidents volunteered as members. (However, it is only fair to note that these administrators have yet to attend any of the committee's meetings.)

The Planning Process and the Academic Information Systems Plan

The long-range planning responsibility of the AIS Subcommittee evolved from a primary goal of both the academic and administrative advisory committees. These committees have recently been charged with the task of developing new long-range (five year) plans for computing at Indiana, with the major emphasis on delineating broad goals and specific objectives. This is being done in cooperation with University Computing Services' staff, who are providing assistance with the evaluation of future technologies in this context. Academic Information Systems is one of the five planning areas for academic computing, and will be one of a similar set of planning areas for administrative computing.

As a joint undertaking, the AIS Subcommittee has been asked to prepare a plan that addresses both academic and administrative computing needs. Since the AIS plan is intended to be part of the larger planning documents (one focused on academic computing and one focused on administrative computing), the subcommittee has been given only two and a half to three months to develop the plan. Another two months will be required to integrate it with the other planning elements to form the overall planning documents. The components of the plan are also prespecified by the larger advisory committees, and include a vision statement, an environmental analysis, specification of general goals, and a measurable set of objectives.

The AIS planning process is now nearing completion, with the final draft of the plan expected within the next two weeks. But enough progress has been made to provide a good bit of detail on the plan itself, and on how it will be implemented. Perhaps the most important component of the plan is *the vision statement*, which provides the definition of the AIS concept described above, and ties this abstract concept to some specific examples. Two excerpts from the vision statement are particularly useful in making that definition more concrete, and in illustrating how the needs we have identified have been translated into the document.

> "AIS should extend the boundaries of the University by facilitating a greater sharing of academic and administrative information across all computing platforms..., and be based on a cooperative relationship among the research, instructional, library, computing and administrative communities."

> "The systems must provide reliable, efficient, and accurate transmission of information from its repository to the desktops of all students, faculty, and staff."

In addition, several very useful examples are provided in the vision statement. These examples are of integrated access to multimedia data for music scores using hyper-media tools; network access to 1990 US Census data residing on the University Library's CD ROM; and integrated, easy access to registration, course, and financial aid information systems for students. An excerpt from the vision statement describes the last of these examples in an especially revealing way. It describes the system as one:

> "...which would allow the student to answer such questions as: What courses can I take to meet my degree requirements? When are these courses offered and are they open? Who is teaching the course? Can I see last year's evaluations of the course or instructor? Can I see the course description and syllabus? Okay, can I register? Great, how much do I owe? (Holy cow!!!) Does my financial aid cover it?"

The vision statement of the AIS plan also identifies the characteristics of the information delivery system to be developed at Indiana University. Specifically, this information delivery system should encourage use by the novice as well as the expert, provide standard tools for data display and manipulation, operate or be accessible at the workstation level, allow for customization by each user, and be deliverable over the network. These characteristics represent a direct response to the need for an integrated, easy to use, information delivery environment that was identified above.

The second component of the plan, *the environmental analysis*, is intended to identify the nature of the existing AIS environment at Indiana University and elsewhere, thus providing the baseline to evaluate what is needed to achieve the vision. The environmental analysis is divided into two components -- one focused on the internal environment and one focused on the external environment. Key conclusions from the internal environmental analysis are that Indiana does have some basic information access mechanisms in place (as identified above) along with the network infrastructure to deliver these mechanisms to the workstation. Although workstation-based tools that can be used to manipulate multi-media data are not yet available, the resources to develop these tools are present in the form of a workstations division in University Computing Services. Comparing Indiana University's AIS efforts to those of other major universities, it is apparent that AIS is a relatively new area for most institutions. While fledgling efforts such as IU's AIE do exist on many campuses, no mature implementations of AIS as defined and described by the planning effort have yet evolved. However, a great deal of interest in this topic is evident across the country, judging especially from the amount of Bitnet and Listserv message traffic discussing related issues.

Five *general goals* have evolved from the planning process. These are also directly traceable to the unmet needs detailed in the preceding sections, and the AIS Subcommittee feels that the goals encompass all of the major areas of effort required to address the unmet needs. The five goals are:

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- Provide integrated access to multimedia (image, sound, and text) data.
- Provide integrated access to campus and external databases that support the needs of the University community.
- Provide access to software tools that facilitate organizing, filtering, and presenting AIS data.
- Provide access to the technology and infrastructure that facilitate organizing, filtering, and presenting AIS data.
- Provide documentation (on-line & paper), education, and support for the AIS environment.

Implementation

Even though the Subcommittee is currently in the process of preparing two or three measurable objectives for each of the goals, the implementation mechanisms are already in place to move ahead with the plan as soon as it is complete. First, the AIS component will be incorporated into the integrated plans for both administrative and academic computing. This will be followed by distributing the resulting planning documents to the Indiana University community via a system-wide newspaper that reaches every faculty and staff member in the eight campus system. The AIS recommendations will then be forwarded to several other University planning committees to assure consistency. One such committee is a Bloomington campus committee charged with planning the coordination of computing, library, audio-visual, and communications resources to enable the delivery of multimedia data and information.

There are four principle implementation mechanisms for these advisory committee planning efforts. The first of these are the annual implementation plans for "application areas." Application areas serve as the focus for University Computing to acquire and support end user computing tools and ways to employ those tools. Each application area plan includes a budget and a task/project list for the coming fiscal year. The objectives generated by the AIS Subcommittee will serve as the focus of the AIS application area implementation plan. Other relevant application area plans that will be affected by the long-range AIS plan recommendations include computer technology in education, network applications, graphics, database, and emerging technologies.

The second implementation mechanism is the process by which University Computing Services budget priorities are established each year. This process represents a combination of University Computing staff, senior management, and advisory committee recommendations. The AIS plan objectives will have a major impact on the establishment of these budget priorities. Even when new funding from the University administration is not forthcoming to support a high priority project, reallocation of University Computing Services' base budget generally takes place to ensure progress on these high priority projects and objectives.

The third implementation mechanism is the 1.1 million dollar systems development fund that was identified above, and is used by the University to subsidize these development projects. This fund is allocated to projects on a competitive basis by a subcommittee of the Administrative Computing Advisory Committee. Not only are four of the twelve members of this systems development subcommittee also members of the AIS Subcommittee, but the focus of AIS corresponds with one of the University's systems development priorities -- namely that of establishing systems that directly meet the needs of faculty, students, and academic staff. It is almost a certainty that several systems development project proposals will be derived from the AIS Subcommittee planning objectives. The probability that some or all of these will be subsidized by the University's systems development fund is very high.

The final implementation mechanism is the day-to-day activities of the AIS Subcommittee itself. Not only is this subcommittee charged with long-range and implementation planning responsibilities, but it is also responsible for recommendations as to the function, design, and content of the current information delivery environment available on the central academic computing systems (the AIE) and the administrative mainframe (USE).

Together, this set of implementation mechanisms should provide the University, University Computing Services, and the AIS Subcommittee with sufficient opportunities for making the AIS vision a reality. This is true even in an era of cost containment.

Conclusions

There are six major conclusions we are able to draw from Indiana University's experience with AIS planning. The first is that we have been able to identify a working definition and concept of "Academic Information Systems" that can be jointly agreed on by faculty, administrators, and academic staff. This concept also includes guidelines for an effective information delivery system. The concept of AIS as defined here is one that is very useful for delineating the scope of AIS activities, and is applicable to any other university or college environment.

Second, there are no mature implementations of the AIS concept, at least as we have defined it. At the same time, our external analysis revealed that this is a topic of great interest at many institutions, and that a number of institutions such as Indiana are ready to move ahead in this area with great enthusiasm.

Third, the role of advisory committees in establishing AIS needs, directions, and implementation is almost indispensable. If it was not for the computing advisory groups at Indiana University and their willingness to work together to establish the AIS concept, we would still be planning for separate information delivery mechanisms that did not effectively meet the University's needs. Indeed, even though computing center staffs worked on AIS issues for several years prior to the involvement of our advisory committees, the staff just could not come to an effective closure on what AIS was, much less how to plan and manage the AIS environment. Again, this is a conclusion we feel is applicable to almost any institution.

Fourth, it should be apparent that there has been an evolution of forces leading up to the identification and delivery of effective AIS services. Not only are the technologies required for multimedia data transfer currently emerging in forms that can be tailored to the requirements of an effective AIS environment, but the needs of our universities and colleges have evolved to the point where delivery of this type of information is essential. The growing competition among institutions for students, research dollars, and qualified faculty and staff makes an effective information management and delivery environment a strategic tool.

Fifth, Indiana University's experience confirms that productive planning and implementation for AIS are possible. We feel this is apparent in this paper even though Indiana is only now nearing the end of the AIS planning effort.

Finally, and perhaps most importantly, Indiana's experience can be readily generalized to other institutions of higher education. We do feel it is important to note that while the merger of administrative and academic computing at Indiana certainly helped to ease the communication process between the administrative and academic community, this was not a critical factor in the evolution of AIS planning. As should be evident in the other sections of this paper, all of the technologies, computing priorities, and needs we have identified were already evolving towards making the Academic Information Systems concept a reality at Indiana University. This evolution was independent of the merger of our former administrative and academic computing organizations.

A COLLEGE POLICY ON COPYRIGHTED MATERIAL[1]

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Management and control of intellectual property have become a prime concern of IS management. In many institutions, information service centers include administrative, academic and library information systems. Intellectual property in these centers may be in the form of electronic data, magnetic and laser disks, magnetic tapes, microfilm, and printed material. They include such information as computer data and programs, music, plays, recordings, and books. Guidelines must be established based on copyright law for the appropriate use of intellectual material in our educational environment. We have developed a "working copy" of a comprehensive copyright policy that we are implementing at Winthrop.

[1] A full-length "working copy" of Winthrop College's copyright policy can be made available by contacting Bill Moressi or Betty Laster in the Division of Information Management at Winthrop College.

WHAT IS A COPYRIGHT?

Copyright is a method that governments use to promote innovation and publication. It is essentially a monopoly given to the creator of an original work for a limited time. By preventing anyone but the creator or author from profiting from the production of a copyrighted work, an incentive to produce such works exists. Our founding fathers considered Copyright so important that they included it in the U.S. Constitution (Art.I, Sec.8).

Copyright covers the expression of ideas, not the idea itself. An idea that results in a useful physical object may be eligible for another type of government protection, the patent. Thus a book about programming may be copyrighted, but the basic principles of how to program may not. Works of authorship include literary works (books and printed material); computer program (software); musical works, including lyrics; video productions (motion pictures, videotapes); sound recordings; and dramatic works.

Congress has tried to balance the right to exclusive benefit of authorship with the public interest by passing copyright laws. The current law was passed in 1976. Besides setting out penalties for violation of copyright, the law also defines situations when copyrighted materials may be used by the public, the so-called "fair use" doctrine.

Notwithstanding the provisions of the Copyright Law (17 U.S.C. §106), the fair use of the copyrighted work, including such use by reproduction in copies or phonorecords for purposes such as criticism, comment, news reporting, **teaching (including multiple copies for classroom use), scholarship, or research,** is not an infringement of copyright. Factors to be considered in fair use are:

1. the purpose and character of the use, including whether such use is of a commercial nature or is for nonprofit educational purposes. Reproduction for commercial purposes is prohibited.

2. the nature of the copyrighted work.

3. the amount and substantiality of the portion used in relation to the work as a whole.

4. the effect of the use upon the potential market for or value of the copyrighted work.

POLICIES AND PROCEDURES

Literary works: Books and other printed materials.

As employees of colleges and universities, we are all aware that our students and faculty use copyrighted materials every day. Certain guidelines in the copyright law and in agreements included in the congressional deliberations leading up to the law provide the legal rationale for our use of these literary works.

Literary works are works expressed in words, numbers, or other symbols manifested in books, manuscripts, cards, or other printed materials. Photocopying of books and other printed material is one of the most troublesome practices facing college faculty. The fair use doctrine allows copying of copyrighted works for teaching, scholarship and research. It does not allow, however, wholesale copying without limit. The basic principle a potential copier should consider is, "Is my copying adversely affecting the possible sale of this work by the copyright holder."

ERIC

The educational community and publishers have agreed upon specific guidelines to help answer this basic question. Winthrop College has adopted the "Model Policy Concerning College and University Photocopying for Classroom, Research, and Library Reserve Use" of the American Library Association as our policy on printed materials. The following example is a case referencing the above fair use question. An instructor may copy an article to hand out in class or put on reserve in the library, if the decision to copy was "spontaneous". A "spontaneous" circumstance would be one where the instructor did not have time to get permission from the publisher. In this case, the instructor should not copy the same article next semester without prior permission from the copyright holder. The instructor has had a whole semester to ask for permission.

Similar guidelines, a single chapter from a book, a single short story, a picture, etc., have been developed for other types of publications. The basic principle applied is that the copy should not be most of the total work.

Copyright law specifically prohibits certain copying. Instructors may not create anthologies by copying many articles and using them together as a basic text for a course. Teachers may not charge students more than the actual cost of the copies. Consumable works, such as tests, may not be copied.

Penalties for copyright infringement include assessment of actual damages to the copyright holder. Statutory damages can go as high as $50,000. Educators are exempted from statutory damages if the copying was believed to be fair use.

Computer Programs

Computer programs are sets of statements or instructions to be used directly or indirectly in a computer to cause a certain result. The rapid emergence and widespread use of computer programs (software) on microcomputers and in local- and wide-area networks raise difficult questions concerning copyright laws.

At the core of our policy at Winthrop is recognition that the copyright law protects all software against copying and distribution even without a license agreement. The **only** exception is public domain software. The policy applies to faculty, staff and students, alike. It includes all application and operating system software used in centralized systems as well as software used on microcomputers.

We categorize the software as purchased, leased, evaluation/demonstration, and public domain. We define non-permissible and permissible use based on the U. S. Copyright Law. Generally, the law prohibits copying for the purposes of distribution either for resale or for sharing.

Specifically, purchased software cannot be copied for simultaneous use on a second computer.

The policy for leased software differs based on whether it is a single copy, a site license, or a network version. Software obtained through a single copy lease is to be treated as purchased and is subject to the same law governing purchased software. Where a site license has been purchased, one is permitted only one serialized copy for use on one microcomputer. When the leased software is used in a network environment, only an archive copy may be made. The number of archived copies will depend on the network's recovery policy. Except for networked versions, the software can be copied for archive purposes or to ease its use, for example, copying to a hard disk for processing.

Evaluation or demonstration software is requested, ordered, and controlled through our College's Library. Copying of this software is considered illegal or unethical without the written consent of the owner.

One is expected to pay a license fee for shareware used when requested by the copyright holder. Public domain software is declared as such and is available for use by all. It is therefore exempt from the copyright law.

Musical Works, including lyrics

Musical works are works that include any accompanying words and are fixed in some tangible medium of expression. Musical works include both original compositions and original arrangements. Copying of music may be undertaken for legitimate educational purposes. We attempted to cover the minimum standards of educational fair use under Section 107 of the Copyright Law. Also, we develop our policy with the understanding that future revisions will be necessary as we adapt to changes of the copyright law defining fair use.

Non-permissible copying would include copying to create or replace or substitute for anthologies, compilations or collective works. Copying whole or parts of works intended to be "consumable" in the course of study or teaching, such as work books and exercises, is not allowed under copyright law. The law prohibits copying for performance, copying as a purchase avoidance, and copying without inclusion of the copyright notice.

The following statements of permissible copying provide only minimum examples of fair use. There may be instances in which copying is permitted under the criteria of fair use, but does not fall under any of these stated conditions.

One may duplicate purchased copies that are not available for an imminent performance provided new purchased copies be substituted directly.

For academic purposes it is permissible to make single or multiple copies of excerpts of works if such excerpts are not performable as a section, movement, or aria. The excerpt may not make up more than 10% of the whole work. Copies of excerpts are limited to one per pupil.

For academic purposes other than performance, it is permissible to make a single copy of an entire performable unit, such as a section movement or aria. The instructor must confirm from the copyright proprietor that the unit is out of print or unavailable except in a larger work. One may use such a copy only for scholarly research or preparation for teaching a class.

Purchased printed copies may be edited or simplified as long as one preserves the fundamental character of the work. In such case, lyrics, if they exist, cannot be altered. Lyrics may be added if they are not present in the work.

A single copy of recordings of performances by students may be made for evaluation or rehearsal purposes and may be retained by Winthrop College or the individual teacher.

Also, a single copy of a copyrighted sound recording owned by the College may be made when the purpose is to construct aural exercises or examinations. This copy can be retained by the individual teacher. This rule pertains to the copyrighted music only and does not include other copyrighted material that may be a part of the recording.

ERIC

Video productions: motion pictures, videotapes

Our focus here is on broadcast programs. *Broadcast programs* are television or radio programs transmitted by television or radio stations for reception by the public without charge. The following guidelines reflect a national committee's consensus on the application of fair use to the recording, retention and use of television broadcast programs for educational purposes. The committee, appointed by Congress in 1979, represented 19 organizations of publishers, librarians, media producers, educators, broadcasters, writers, and others. The following information reflects some views expressed by the committee.

A broadcast program may be recorded off-air simultaneously with broadcast transmission (including simultaneous cable transmission) and retained by Winthrop College for a period not to exceed the first forty-five (45) consecutive calendar days after date of recording. Upon conclusion of such retention period, all off-air recordings must be erased or destroyed immediately.

Off-air recordings may be made only at the request of and use by individual teachers. One may not be regularly record them in anticipation of requests. No broadcast programs may be recorded off-air more than once at the request of the same teacher, regardless of the number of times the program may be broadcast.

An instructor may not use off-air recordings in the recording institution for student exhibition or any other non teaching or teacher evaluation purposes. One may not alter recordings from their original content, that is, they may not be physically or electronically combined or merged to constitute teaching anthologies or compilations.

Off-air recordings may be used once by individual teachers during relevant teaching activities. They may be repeated once only when instructional reinforcement is necessary, in classrooms and similar places devoted to instruction within a single building, cluster or campus, also in the homes of students receiving formalized home instruction. This must take place during the first ten (10) consecutive school days in the forty-five (45) day calendar day retention period. "School days" are school session days, not counting weekends, holidays, vacations, examination periods, or other scheduled interruptions, within the forty-five calendar day retention period.

Teachers may reproduce several copies from each off-air recording to meet the legitimate needs under the following guidelines. Each such additional copy shall be subject to all provisions governing the original recording. After the first ten (10) consecutive school days, off-air recordings may be used up to the end of the forty-five (45) calendar day retention period only for evaluation purposes. Such an evaluation may be to decide whether to include the broadcast program in the instructional curriculum.

In cases in which Winthrop College enters into a formal licensing agreement with the holder of a copyright of an audio or video production, the provisions of the license shall govern the conditions of copying and use of such productions.

Sound recordings

A *sound recording* is a work that may be fixed on a physical medium such as a phonorecord. The phonorecord may be a tape, cassette tape, cartridge or disk. In this section, reference to a phonorecord will be about that device upon which a sound recording is fixed.

The owner of a copyright of a phonorecord has the exclusive rights to distribute copies of the phonorecords of the copyrighted work to the public by sale or other transfer of ownership, or by rental, lease, or lending (17 U.S.C. § 106(3).)

The owner, by purchase or transfer of ownership, of a particular phonorecord obtained under section 106(3) may, without the authority of the copyright holder, sell or otherwise dispose of that phonorecord. The owner, however, may not dispose of directly or indirectly the phonorecord sound recording for purposes of commercial advantage by rental, lease, or lending. Nothing in the preceding sentence shall apply to the rental, lease, or lending of a phonorecord for nonprofit purposes by a nonprofit library or nonprofit educational institution (17 U.S.C. § 109(b)(1).)

Dramatic works: plays

Dramatic works include plays, pantomimes, and choreography prepared for stage presentation and scripts prepared for cinema, radio, and television. Copying of dramatic works may be undertaken for legitimate educational purposes. The following statement of guidelines is not intended to limit the types of copying permitted under the standards of fair use under judicial decision that are stated in section 107 of the Copyright Revision Bill. There may be instances in which copying that does not fall within the guidelines stated below may, nonetheless, be permitted under the criteria of fair use.

One may make copies under "emergency" conditions to replace purchased copies that are not available for an imminent performance. Purchased replacement copies shall be substituted directly.

For academic purposes other than performance, single or multiple copies of excerpts of works may be made. The excerpts must not comprise a part of the whole that would constitute a performable unit such as an act or scene and never more than 10% of the whole work. The number of copies shall not exceed one per pupil. A teacher may make a copy of an entire performable unit for research or teaching purposes if the unit is confirmed by the copyright proprietor to be out of print or that it is unavailable except in a larger work.

A purchased, printed copy may be edited if the teacher does not distort the fundamental character of the work. A single copy of recordings of performances by students may be made for evaluation or rehearsal purposes. The College or the individual teacher may retain a copy.

One may make a single copy of a sound recording (such as a tape, disc or cassette) of copyrighted dramatic works from sound recordings owned by Winthrop College or an individual teacher for constructing aural exercises or examinations. This pertains only to the copyright of the dramatic work itself and not to any copyright that may exist in the sound recording.

Copyright law in the educational environment does not permit copying to create, replace or substitute for anthologies, compilations or collective works. One may not copy dramatic works intended to be "consumable" during study or instruction such as workbooks, exercises, standardized tests and answer sheets and like material. Should a copyright notice exist on the printed material, it must be included on all copies.

ADMINISTRATION

Policy development and communication

Administration of the copyright policy includes communication, implementation, evaluation, and revision of the policy as needed. It will be the responsibility of the Computer Utilization Committee to develop supporting materials to help in communicating the policy to the faculty, staff, and students of Winthrop College.

The Executive Director of Information Management, working under the direction of the V.P. of Academic Affairs, will be responsible for distributing supporting materials to the college community on copyright policy. The Executive Director also will provide for seminars to the college community on copyright policy. Finally, the Executive Director will record valuative feedback of the effectiveness of the policy. Feedback will be channeled through the Administration to the Computer Utilization Committee for review and possible recommended revision.

TABLE I
Recommended procedures for dealing with probable policy violations.[2]

ACTION	FACULTY	STAFF	STUDENTS
Allegation	In writing	In writing	In writing
Investigation	Executive Director of Information Management	Executive Director of Information Management	Executive Director of Information Management
Disciplinary Action	Dean of Academic Unit and Senior Vice President for Academic Affairs according to "Termination Procedures" in Faculty Manual	Department Head Area Vice President and Vice President for Academic Affairs according to "Guidelines for Disciplinary Action"	Associate Dean for Student Development and Senior Vice President for Academic Affairs according to the Student Conduct Code's "Disciplinary Process"
Appeal	Policy and Procedures for Employee Grievances and Appeals	Policy and Procedures for Employee Grievances and Appeals	Student Conduct Code's "Disciplinary Process"

[2] These procedures are currently under review by the President's Office and Faculty Concerns committee.

Infringement

Table 1 outlines recommended procedures for handling probable copyright policy violations. Alleged violation of this policy will be investigated by the Executive Director of Information Management. Disciplinary steps will be taken against individuals violating copyright policy during College-related activities or individuals using College resources to conduct or assist in unlawful copying. Appropriate action will be taken for faculty, staff, or students according to procedures outlined in Winthrop College's College Faculty Manual, Guidelines for Disciplinary Action, and Student Handbook, respectively. Possible disciplinary actions will depend on the facts and circumstances of each case and most likely will include restitution to the copyright owner. Also, individuals may be denied access to the College's facilities. Severe and blatant violation of copyright can result in termination of employee or student status.

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CAUSE90 MIAMI BEACH NOVEMBER 27-30, 1990

TRACK VII

MANAGING APPLICATIONS AND TECHNOLOGY

Coordinator: Reid Christenberry, University of Georgia

Papers in this track describe how colleges and universities are incorporating emerging technologies into their campus environments: hardware, software, and procedural techniques.

BEST COPY AVAILABLE

The Iowa Student Information Services - A Distributive Approach

This presentation deals primarily with how The University of Iowa implemented a distributed Student Information System. This is a user-friendly interactive system that enables students to process their own registration request through a computer or terminal in one of 22 Instructional Technology Centers (ITCs) on campus or terminal that is connected to the system, including dial-up.

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The Iowa Student Information Services - A Distributive Approach

Where we were

Prior to 1978 the UI had an arena type registration system. In the Fall of 1978 on-line registration was implemented where trained terminal operators were used to enter the course information.

Transition

The impetus to develop the Distributed Registration (DR) system came from a desire on the part of University planners to provide a simple, flexible system that gave the students more responsibility and made it more convenient for them to register.

Originally University personnel considered developing a touch-tone system, but because of the high cost of implementing such a system and the fact that the University faced budget constraints, the idea of a touch-tone system was delayed.

Following a discussion between the Registrar, Administrative Data Processing (ADP) personnel and the director of the Office of Information Technology (OIT), a decision was made in January 1989 to make use of the University's 22 existing Instructional Technology Center (ITC) facilities in developing a new registration center.

We went with this concept because the terminals were available, the communication network was basically in place, and the monitors were in the ITC's. We felt we could implement the DR system at approximately one-third the cost of a touch-tone system and that the system would pay for itself over the next two years, due to reduced need for staff in the registration center.

This concept also allows us to provide many other services to students in addition to registration, such as address changes, campus employment opportunities, messages to and from Registrar and student. Because this system is much more than a registration system the name chosen for it was Iowa Student Information Services (ISIS).

Many issues had to be discussed and resolved in order to design, code and implement a system of this magnitude. Perhaps the major concern was the preservation of the Universities mandatory advising system. The fact that we had been in the online registration environment for many years allowed us to go on a "fast-track" for the system development. Because many of our files, data bases and software were unchanged or only slightly modified, the transition to ISIS was a relatively smooth one.

The biggest change for ADP was that we normally develop systems for use by trained CRT operators. The ISIS system required that we follow a different approach and develop a "user-friendly", menu driven system with help screens that even a novice operator could use. We worked closely with staff at the WEEG academic computing center, who were more familiar with this type of system.

The timetable of DR was as follows:

January, 26, 1989	Final decision to implement the DR system
March 1, 1989	System design completed by ADP and Registrar
April 3, 1989	Program development begins
October 2, 1989	ISIS training for registration personnel
October 25, 1989	Test registration for 100 randomly selected students
November 1, 1989	ISIS system installed in production CICS; test students allowed to register for Spring
November 15, 1989	Start of registration for spring 1990 session: 2400 students allowed to use system

Where we are

At the completion of the early registration in December 1989 it was clear that the system was a success, response to a questionnaire to the pilot group was very positive, full implementation was scheduled for summer and fall 1990 early registration in April 1990. The registration was very successful and while students were not required to use ISIS themselves 72% of them did their own registrations.

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With all the other services provided by ISIS, the system is used throughout the year. Of course the peaks are during registration, but we get 20 to 100 address changes daily and the employment opportunities are used daily. Also students can check registration information at any time.

One concern of the DR system is that early registration usually happens to fall during the busiest times of the semester, when many students are using the ITC's to complete papers and research projects. To address this issue, ITC's are staying open longer and scheduled registration times were extended into the evening and weekend hours.

The ISIS system is available around the clock, except for 15 minutes sometime between 1 A.M. and 6 A.M. However most ITC's are only open between 6 A.M. and 12 midnight. During early registration periods students are scheduled to register from 8 A.M. to 9 P.M. on Monday through Saturday. They are currently allowed to register or change their schedule at any time after their registration time until the start of the term. No time limits are placed on the students when they are at the terminal.

During summer orientation sessions all new students register themselves at one of the ITC's. It is hoped that at a date in the near future this will lead to near 100% participation in the use of the ISIS system.

Since the system is used by the registration center personnel, all students are registered through the system. This has led to greater accuracy and consistency throughout, since many enhancements have been added to the new system.

Implementation of the DR system was possible through a combined effort of the Registrar's Office, ADP, WEEG Computing Center and Telecommunications. While not unique to the University of Iowa, the ISIS system is a relatively new concept and the University of Iowa is one of the pioneers in the area.

Future

The future of ISIS is very exciting. With several areas of use either being programmed, planned or discussed, it will constantly be developing into a more encompassing student information system. Perhaps in the near future students will be able to handle all of their administrative dealing through the ISIS system.

In January 1991 ISIS will be used by the registration center personnel to do late registration and drop/adds. This service will be extended to the general student population in the June 1991 session. Other services being discussed are requests for transcripts, degree audits, degree applications, admissions applications and additional financial aid services.

We at the University of Iowa see the future of ISIS as almost unlimited.

Preparation for Registration

The University of Iowa registration system allows students to enter their own registrations via personal computer or computer terminals located at 2 Instructional Technology Centers around campus.

There are four things to keep in mind as we view this registration process. One, The University of Iowa had an effective online registration system in which part-time computer terminal operators entered the registrations for the student at a centralized registration center. Two, mandatory advising is in effect for all colleges except the College of Business Administration. Three, the Iowa Student Information Services (ISIS) system is in effect until the first day of classes. And four, the screens and response messages were designed with the aid of our Academic Computing Office (WEEG) to ensure the use of terminology and screen responses that other students would have encountered in other student-used programs.

Preparation for a registration period begins with the printing of the Schedule of Courses for that particular semester which is approximately six weeks prior to the scheduled registration. At this time, registration forms are printed for all students registered during the current semester. These forms contain demographic data, a course listing area, as well as the student's registration time and unique registration number. These registration forms are mailed to advisers; therefore, the registration number becomes synonymous with adviser approval since the number is issued to the student only by the adviser. A degree audit is sent to each student and adviser also.

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At this time, a session segment containing the registration time and number is added to the student database. As registration forms are produced for new and returning students, whether in a batch or online mode, a student/session segment is added to the student database.

So for demonstration purposes, the student has met with adviser, made course selections, and is ready to process registrations at the ITC of choice. The Schedule of Courses contains information on the open hours for ITC's and Registration Center as well as the instructions on how to access the ISIS system through the various computer devices available. Students are encouraged to review these instructions, check eligibility to register, and availability of courses prior to their assigned registration time. By assigning registration times, senior and graduate students have first priority on course selections and also distributes the registration activity over a 14-day period. Times are assigned from 8 a.m. until 9 p.m., Monday through Saturday. Most ITC's are open until midnight and the ISIS system is available 24 hours a day.

ISIS Registration System

There are basically, three levels of student security for entry -- the student social security number, a password, and the registration number -- the latter is required only for the original registration screen entry. If this is the first time a student has been eligible to register, the password is entered by the computer as the student's birthdate. The student then must change it to a password of choice as long as it is one to eight digits in length. This is stored in the system but visible to no one. If a student forgets the password it can only be reset to birthdate by going to the Registration Center. If a student loses the registration form, a new registration form or number will only be issued through the adviser.

As we progress through the registration process, remember that sample screens are printed in the Schedule of Courses and Help screens are provided in the ISIS system for most screens.

If the student enters a social security number that does not exist on the student database an error message is given and any further action is prohibited. If the student enters an incorrect password, five attempts are allowed. On the first two attempts, a gentle reminder is given. On the third and fourth attempts, a more forceful message reminds the student that only five attempts will be allowed. On the fifth attempt, they are exited from the system. We do not block reentry at this time.

When the student has entered the correct birthdate as password and this is the first entry into the ISIS system, the student is required to change password. For security reasons, the password is nondisplay. For this reason, the password must be verified by reentering. The new password will remain in effect until the student makes a change and the student will need to enter the password each time the system is used. This is the student's security of his/her registration and other data.

The Current Location Screen is next displayed. This information is used for two reasons -- the printing of a copy of the class schedule after registration is completed and the collection of statistics on the activity through the various locations. Because some computer devices are direct cable, some are through communications lines such as Gandolf, and some are via phone, the exact locations cannot be captured by the mainframe computer.

The ISIS Main Menu is now displayed. It is anticipated that other office will add to the functions listed. At the present time, the Financial Aid/Student Employment Menu is the only non-Registrar menu at this time.

The Registrar Main Menu and Registration Menu are requested. This forces the Messages/News Screen if messages exist. These nearly always exist, since Registrar's Offices always have information to dispense. This is used mainly to remind students of address changes, inform when validation sticker will be mailed, and also inform of the session in effect. This comes into play particularly during our April registration when students may register for both the summer and fall semesters.

Most of the functions viewed on this menu may be viewed by the student in the weeks prior to registration time and some of the functions, such as degree applications and transcript requests are not available as yet. Obviously, prior checking of registration eligibility and course availability will help the process.

```
Command --> _        Registration Menu              SPRING SESSION 1991 (90-4)

     Type the number of the desired function on the command line and press
 Enter or Return.

              Function

      1       View course listing

      2       View the "How to register screen"

      3       Change the session for which you are registering

      4       Check your eligibility to register

      5       Register or change class schedule

      6       View or print your class schedule

      7       College, major and adviser check


 Commands: X=Exit System; M=Registrar Main Menu; ?=Help
```

Since our purpose is registration, the Command Code is 5 is entered and results in the Registration Number Entry Screen. This is a four-digit number and since it is on the registration form which the student received from adviser, three attempts at entry are given. Here again, the first attempt is gentle, but on the second attempt the warning is more severe and contains the statement of consequences.

Successful entry of registration number checks eligibility to register. If a student is ineligible for various reasons, the messages are designed to give specific reasons and specific actions. When a student is attempting to register prior to the correct registration time, the response indicates the correct registration time. When the student has a university bill that is overdue, the response indicates a referral to the Cashier's Office. Also the University has a measles immunization requirement which must be met. Since the ISIS system is reading all the support files directly, a clearance of any of these not-permit actions can be made in the appropriate office and instantaneously be reflected for registration purposes. In the case of indebtedness, the file checks whether the existing indebtedness is actually due or has just been billed. If the not-permit exists, the student is not allowed to proceed further in the registration process. Support files do have the capability to make exception overrides. For instance, an earlier registration time request might be granted for an individual student and therefore a new registration time will be entered on the student database.

Students who are eligible to register are taken directly to the Registration Screen. At first glance, this appears to be a fairly simple screen; however, it will quickly be filled through the registration process. Messages from course action will be displayed at the top of the screen. As courses are accepted for entry on the left of the screen, they will be displayed on the right side of the screen by department and course in ascending order. The left corner is reserved for the open sections display.

```
Command --> _      Registration Screen                SPRING SESSION 1991 (90-4)
Name: SAMPLE STUDENT                        College: A   Total Hours: 00



Action Code _
 A=Add;D=Drop;                               Current Schedule:
 C=Change Section;      Dpt Crs Sec SH Title            Time           Days
 H=Change Hours
Department    ___
Course        ___
Section       ___
Hours         __



Commands: C=Class Schedule Screen(provides exit to menu screen);
          S=Scroll Current Schedule; Note:*=Class time conflict may exist
```

Registration

The action code must be entered for each entry and thus set in place the various validity checks. The University of Iowa has historically used the department, course, and section number for registration in lieu of an index or sequence number. To begin course entries, an A for Add action is entered and the three-digit department, course and section numbers and the two-digit hours. If this is a valid action and therefore the course is accepted and displayed on the right. Each action is confirmed or an explanation as to why the action is invalid.

If the student wishes to change the section, the action code of C is entered and the department, course, section, and hours to be changed. Upon entry, the department, course and hours remain and the section is blank with the cursor positioned for section entry. The message above reminds student of current section and tells student to enter new section, the new section is entered, the confirmed message is displayed and the new section is listed at the right side of screen. This is double bright on most computer devices.

One of the very helpful innovations in the registration system is our display of Open Sections Available. When a course is closed due to maximum enrollment, the closed message is given at the top of the screen and reminds the student of the original section requested. Here again, the department, course, and hours remain and the cursor is positioned in the section field. The lower left displays the first open sections of the course to a maximum of seven. If there is a section open at the same time as the original section requested, this section is displayed only. If additional sections need to be viewed, the student can go to the Course Listing Screen for further selection.

```
Command --> _      Registration Screen             SPRING SESSION 1991 (90-4)
Name: SAMPLE STUDENT                   College: A   Total Hours: 07
Section 001 is cancelled. No other section at the same time
and day is available. Other sections appear below Open Sections Available.
To add one of these sections, or another section, type the new section
number in the section field and press Enter or Return.
Action Code a
 A=Add;D=Drop;                          Current Schedule:
 C=Change Section;    Dpt Crs Sec SH Title            Time        Days
 H=Change Hours       004 007 001 03 GENERAL CHEM I   12:30       T
Department   004                                      11:30       MWF
Course       016                                      4:30        TH
Section      ___      010 001 001 04 RHETORIC         7:30        MTWTH
Hours        03
Open Sections Available
004   1:30-4:20  M
      4:30       T
005   1:30-4:20  M
      4:30       T
006   1:30-4:20  M
      4:30       T
007   1:30-4:20  M
Commands: C=Class Schedule Screen(provides exit to menu screen);
          S=Scroll Current Schedule; Note:*=Class time conflict may exist
```

Special Permission Courses

Courses that are designated as requiring special permission for registration are indicated in the Schedule of Courses and entered with a series of codes that check the type of student requiring special permission. For instance, business courses are coded to allow students with business majors to register but students other than business majors need to acquire special permission. Departments may select three ways in which to give special permission. One, and obviously preferable, is to enter the special permission course on the student database. At the present time, all dean's offices and some departmental offices have this capability. Second, a series of random numbers may be issued for dispersal by the instructor or department. These random numbers are keyed to the course and when a student uses a special permission number, it is flagged as used on the course database to prevent its reuse. Third, an instructor's signature can be entered on the registration form and processed through the registration center.

If a student has entered a registration in a special permission course for non-business students and the course is not entered on the student database, the special permission number area is displayed for entry. The message is specific as to what office needs to grant this special permission. If the student has obtained it, the special permission number can be entered and registration in the course is accomplished. If the student database had contained the special permission course, the student would have been accepted into the course immediately upon entry. If this were a course which requires an instructors signature, the course would not be accepted through ISIS.

Independent Study courses have as a section number the instructor number as assigned by the department. This is used for producing separate class lists for these courses and also for producing instructional data information. The instructor numbers are added to the course database prior to registration. When a student registers and enters the instructor number, the validity of the number is checked, but the instructor number is not flagged because it needs to be reused by the instructor for additional independent study students. The registration system requires a valid instructor number as a section number for this type course.

Hours Change

If the student wishes to change hours, an action code of H is entered and the department, course, section and hours to be changed. Upon entry, the department, course and section remain and the hours are blank with the cursor positioned for hours entry. The message above reminds students of current hours and tells student to enter appropriate hours. If new hours are accepted, the confirmed message is displayed and the new hours listed at the right side of the screen. However, University regulations allow only graduate students to take a course for reduced hours. Other colleges allow students to audit or register for zero hours with special permission. Even when an accepted audit hours is made, the student is informed that the fee hours assessed for the course is the minimum for which the course is offered. Special permission for audit is processed in the same way as other special permission courses.

Problem Courses

Certain courses have components that need to be linked together for registration. An example of this would be one of our math courses which has an option of lecture and an option of discussion. Since separate class lists and reports on instructional effort need to be produced, the students are required to register in both components of the course. By using a set of codes (affectionately called Problem Course codes), the components are linked together so that when a student registers in the first component, a message is given on the selection of the second component. We display the choices of the second component in the lower left corner of the screen. Similar to a section change, the department and course remain so the only entry required by the student is the new section and hours. Registration in the course does not occur until both components are selected; however, a place has been reserved in the first component. When entry has been accepted, you will note that both entries appear on the right side of screen. Conversely, when we drop one component, both components are dropped.

Drop Courses

The system does allow the students to drop all their courses. This constitutes a void of total registration and the message confirms this fact. Since we view the electronic record as a contract for registration and fees, the voiding of this contract is important to confirm.

Registration Confirmation

All screens have had the capability of exiting the system so a student can stop and start at any point during the process. One exception to this is the registration screen. Because we wanted to officially confirm the registration and give the student an opportunity to request a printed copy, the registration screen must be exited through the Class Schedule Screen. This screen also gives one more notice of any course conflicts. The Class Schedule Screen is set up so that the printed copy is a screen dump. If the ITC in which the student registered does not have a printer, the student can go to any other ITC or to the Registration Center and use the Command 6 (View and Print Your Class Schedule) on the Registration Menu.

Additional Registration Features

Once students have completed registration, they may enter the registration system at any time to make updates or check on course availabilities. The security for entry would be the social security number and the password entered by the student. This password may be changed at any time as well. Registration changes can be made until 5 p.m. the night before classes begin for that session; however, viewing can be done at anytime.

As registrations occur in which a class time conflict exists, an asterisk appears to the right of the entries that are in conflict. Because the University of Iowa has valid time conflicts between certain courses, it was decided to inform the student and not to prevent the conflict to exist. This is an academic matter, but since we have programmed to identify the conflict it would be very easy to prevent the conflict. It was also decided not to prevent multiple registration in the same course. This again would be easy to prevent, but is based on academic considerations. The student obviously has the option of correcting the conflict by adding or dropping courses involved.

Undergraduate students who wish to register in a graduate level course must obtain special permission from the instructor of the course. A message to this effect appears at the top of the screen and the special permission number is requested. Similar to the special permission courses, if the course appears on the student database as permission granted the message would not occur in the registration process.

Maximum hours of registration are in effect for all colleges. When a student exceeds this maximum, a message to this effect appears at the top of the screen. Exceptions to maximum hours are granted only by the deans' offices and since these offices have the student database, an override can be entered. Here again, if the exception exists, the message would not appear.

The Student Comment Screen was designed as a suggestion box for students to leave comments on the registration procedure. Our original fear that this might be a "gripe" screen was not confirmed. Student comments helped us to identify good and bad points of our procedures. We could also identify any ITC scheduling problems as well as assess the helpfulness of monitors and coordinators in these centers. Approximately 95 percent of the comments were favorable and mentioned the fact that registration lines were eliminated, the hours of registrations were more conducive to student schedules, and made preplanning and course selections much easier. The Student Comments are delivered to the Registrar's Office on a nightly basis and these are reviewed by personnel in the Registration Center and in the WEEG Computer Center. This was an important part of our registration process.

```
Command --> _      Course Listing Screen            SPRING SESSION 1991 (90-4)
Type the department, course, and section numbers in the provided areas and
press Enter or Return. P = Special Permission Required


Department ___ Course ___ Section ___
           Title              Sem. Hrs P Status  Time        Days    Room  Bldg
004 016 001 PRIN OF CHEM LAB  02          CANC
004 016 002 PRIN OF CHEM LAB  02          CANC
004 016 003 PRIN OF CHEM LAB  02          CANC
004 016 004 PRIN OF CHEM LAB  02               1:30-4:20    M        223A CB
                                                4:30        T         225 CB
004 016 005 PRIN OF CHEM LAB  02               1:30-4:20    M        223B CB
                                                4:30        T         225 CB
004 016 006 PRIN OF CHEM LAB  02               1:30-4:20    M        223D CB
                                                4:30        T         225 CB
004 016 007 PRIN OF CHEM LAB  02               1:30-4:20    M         269 CB
                                                4:30        T         225 CB
004 016 008 PRIN OF CHEM LAB  02               8:30-11:20   T        223A CB
                                                4:30        T         225 CB
004 016 009 PRIN OF CHEM LAB  02               8:30-11:20   T        223B CB
                                                4:30        T         225 CB
Commands: X=Exit System; M=Registrar Main Menu; R=Registration Menu; ?=Help;
S=Scroll Forward; E=Register or change schedule
```

We now want to look at the additional screens that are accessible through the Registrar Menu. The Course Listing Screen is available to students, deans' offices and departmental offices and gives the up-to-date status of courses. Note that it can be access to begin with a department, with a particular department and course, or with a particular department, course, and section. The last option is especially helpful when the student wishes to see additional options to the Open Sections Available section of registration screen. In addition to the usual necessary items, such as title, semester hours, meeting time and place, the special permission code and status of course are indicated. A complete definition of these codes are included on the Course Listing Help Screen. Remember this is viewable prior to registration.

Some courses are indicated as Departmental Wait Listing and others as Wait Listing. Students are referred to the department when the department maintains its own wait lists. The Registration Center maintains wait lists on those courses in which the department has requested our monitoring. Special screens are provided in the Registration Center for this purpose. Students are not allowed to be placed on a wait list unless the total course is closed and a maximum of two courses per student can be wait listed. The time of request is recorded and this information supplied to departments for action.

Support Screens

The College, Major and Adviser Screen is provided for students to verify their current status. Occasionally students have forgotten their adviser's name or address or a change may have occurred within the department. This screen is useful in making an adviser appointment and obtaining the registration form.

The Change of Address Screen provides a convenient way for the student to meet the University requirement that a change of address be reported within three days. The student can enter a new residing address and an effective date. This change will then go into effect on that date and will be made on all University files, including payroll. Home and Parent Address are provided for information only and the student must submit a Change of Address form to change these, since the volume and procedure is different. This screen is accessible at all times.

Also accessible from the ISIS Main Menu is the Financial Aid/Student Employment listing. This provides employment information on a timely basis and has eliminated student traffic in our Student Financial Aid office. We look forward to other enhancements.

One important support screen is the Special Permission/Enrollment Update Screen which is accessible in departmental office with computer support. From the Registrar Main Menu, the Department Menu can be selected and then the support screen. The department requests the department, course, and section needed to display the status and enrollment figures. The current enrollment is the actual number of student enrolled at the present time, the optimum number is an adjustable figure to control numbers in sections especially during Freshman Orientation, the maximum number is the number to be allowed into the section, and the capacity is that of the room assigned. Optimum and maximum can be changed, but not to exceed the room capacity. In this way, departments can directly control section enrollments.

The same screen is used to record students who have received special permission to register in the course (if required). As the social security number is entered, the student database is checked and responds with the name of the student for the department to verify. This information will now be accessed through the registration process.

By use of a set of security codes, a department is authorized to make changes to only their department courses and their special permission codes. Exceptions can be made by the authorizing department and these are entered through the Registrar Security Control screen.

Summary

The real benefits of this type of registration system is that throughout the process the control is placed in the hands of the person needing to make the decision. The student controls course selections, support offices control the clearing of registration holds, and departmental and deans' offices control the enrollment figures which are under their departmental budgets. Much cooperation is required in the Schedule of Courses, but once this is accomplished, no phone calls or paperwork impedes the process of registration. If a department wishes to work directly with the registration of the students the system will allow this as well.

We finally have a registration process which occurs while we sleep!!

MLH/skm

U-BUY - ONLINE REQUISITIONING - ONE GIANT STEP

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CAUSE CONFERENCE 1990

CHALLENGES AND OPPORTUNITIES of Information Technology in the 90's

UBUY On-Line Requisitions - One Giant Step!

Abstract:

In the Summer of 1989, Boston College implemented the on-line U-BUY Requisition System. Today, after a year of operation, we have over 600 users in 130 campus departments. The only way to produce a check requisition or a purchase order is through the UBUY System. There are no manual routes to bypass the System!

UBUY was our first information system that required on-line preparation of financial transactions in 130 departments. The system incorporated the concepts of a Universal Position System that classified position privileges (including computer security access) and an electronic signature component that controlled system/account access and limits of spending. It represents a significant step as we cross the threshold of campus-wide information systems into the 90's.

We look back and view this development as a 'watershed' application that challenged our users and presented the opportunity for elevating the level of computer literacy and comfort throughout the campus. U-BUY also represents prototype application on which increased campus wide functionality will be provided in the early 90's.

ERIC

Cause Conference 1990

U-BUY - On Line Requisitioning - One Giant Step!

INTRODUCTION

Over the past year and a half, Boston College has implemented the University Requisition System called U-BUY. This paper/presentation describes the general concepts and system features of U-BUY. The systems development life cycle is outlined over the two years of development along with the problems that emerged.

Finally, there will be a summary of a survey of the University Community to measure the community's reactions to the implementation of the project, the functionality of the system, and the experiences and effects of the first campus-wide system involving the input of critical financial transactions.

WHAT IS UBUY?

A. Overall System Structure

U-BUY is a menu-driven on-line requisition system with functional capability to do a number of financial transactions.

The UBUY system works in conjunction with other components in our administrative Systems environment. The components and their functions are listed below:

1. Universal Position System

   This system contains a record for every position in the University and it contains the position's campus address, campus phone number, and computer access privileges. It is a part of the overall Human Resources System and it dynamically interacts with the Payroll Personnel System components.

2. University Signature System

   This system defines, account approval, authority for university positions. One type of approval record is a requisition approval. Another type of approval record is a budget transfer approval record. Future types of approval records will be payroll time sheet approval records and personnel action-form approval records.

3. University Accounting System

   As U-BUY requisitions are entered into the on-line system, there is an access of the accounting files to verify that there is a valid account for the transaction and that there are sufficient funds available to make the purchase or payment. If funds are available, then an encumbrance is immediately established and the balance available on the line is reduced.

Critical to the control considerations of U-BUY is the interaction with the University's Financial Accounting System in the functions of:

Requisitioning
Invoice Matching
Application of Credits
Release and Payment

4. University ID System

This system identifies all individuals associated with the university (student, employees, and other defined groups). It keeps track of each individual's current status and grants specific privileges based upon that status. These privileges include (but are not limited to) recreation complex entry, library privileges and administrative systems access. The level of access given within the administrative system is determined as a composite of access given to each of the individuals currently active positions (this includes U-BUY signator access).

B. Overall System Operation

1. Requisitioning

The terminal transactions of U-BUY are accessed through CICS in an MVS environment. The User inserts a PIN number and a Username to sign on to the system. With this information the system knows the Universal Position Number(s) of the signed on User and thereby sees what computer access privileges are available to the position number(s) of the signed-on User. If the employee has access to U-BUY, then a menu is presented. The User selects a function and one or more functional sub-choices are presented.

When a line of information is entered, the system edits the data, verifies the User has access to use this account (or account sub-code line) and has funds available to spend from this account.
(If a User is purchasing supplies from a sub-code line, but has no funds in the sub code line, then the User may exit the process, go to the budget transfer function, and transfer funds from some other line into supplies. Then the User can return to the requisition process and process a requisition on the supplies sub code line).

The User can insert a number of lines, and each line is edited appropriately. When the User is finished entering lines, the system goes to a closing screen which is preformatted accordingly, depending on whether the transaction is a purchase order or a check requisition. The User can change the defaults presented on the closing screen, and can optionally insert comments before marking the transaction as complete by inserting a private password in a screen-darkened area.

ERIC

2. Approvals

If a line item on the requisition exceeds a unit cost of $500, the requisition is electronically routed to a second approver of this account. If there are no lines with a unit cost of $500 or more then a purchase order is immediately routed electronically to the Buyer in the Purchasing Department. Check requisitions are routed electronically to the Accounts Payable Department of the Controller's Office. Receipts for check requisitions transactions are inserted in a specially designed blue envelope. Campus mail services gives these envelopes express sorting and transmission to the Accounts Payable Department. Some Purchase Orders require approval by buyers before they are printed on a laser printer in the Purchasing Department. Other purchase orders are immediately printed in the Purchasing Department after a User has inserted a password on a requisition.

3. Invoice Matching and Payment Release

Accounts Payable reviews receipts and invoices and releases check requisitions which are paid on a batch check run that runs three nights a week.
The Purchasing Department matches invoices to PO's on lines, resolve problems and closes out purchase orders. Invoices are transmitted to Accounts Payable and payments are released against purchase orders.

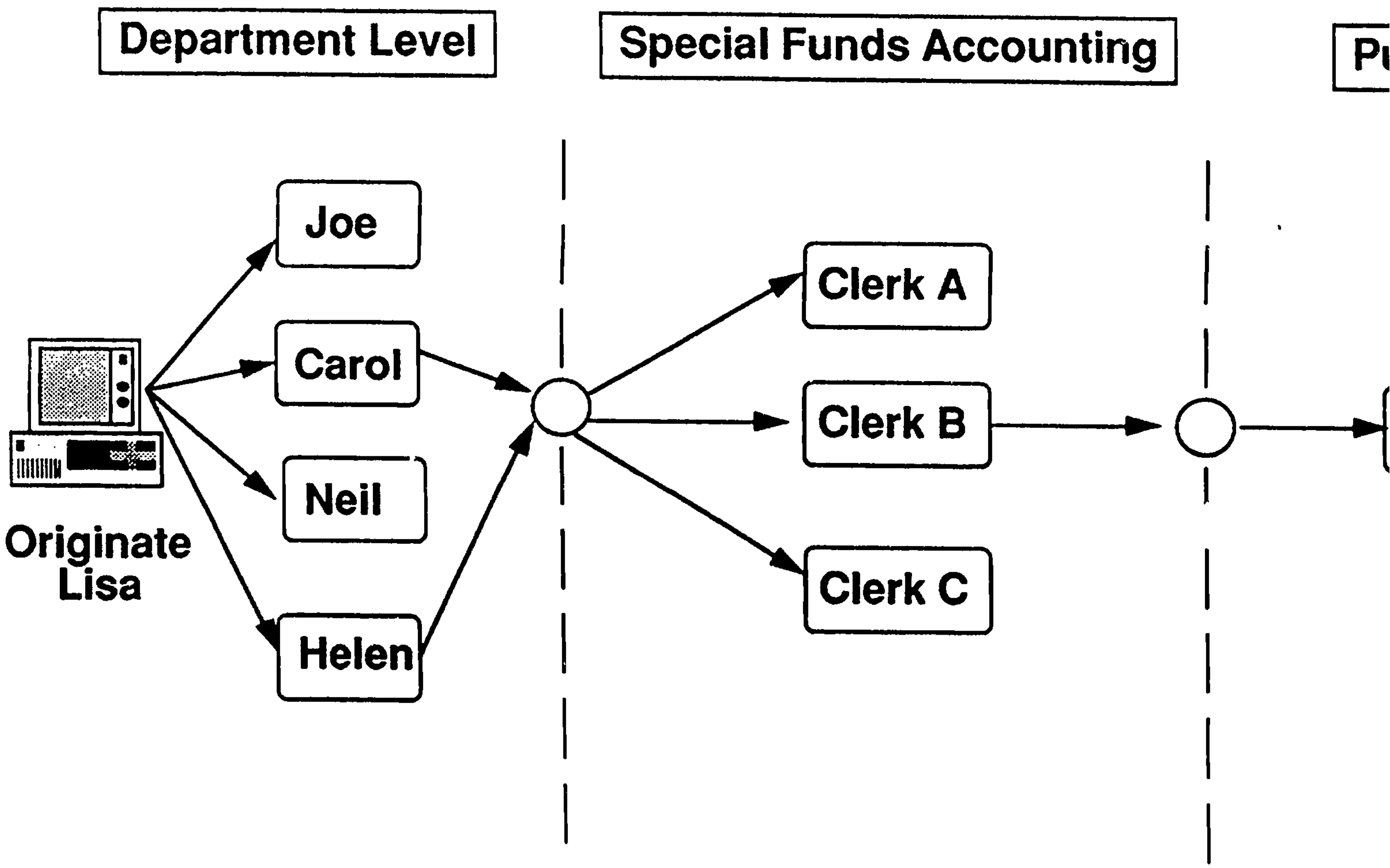
4. Viewing Requisitions

All Users can view their requisitions in a number of different ways.

- Unpaid Originator's Requisitions
- Paid Originators Requisitions
- Unpaid Department Requisitions
- Paid Department Requisitions
- All Requisitions by an Account Number
- Any individual Requisition
- Last Year Requisitions

Signator Approval records for requisitions contain the type indicator, the position number, the account number and limits to spending on the specified account. An employee with fiscal responsibility for a number of accounts will have a minimum of one record for each account.

Approval Forwarding



C. Campus Wide Functionality

Authorized Users in any of our 140 departments may originate many different transactions provided they have security clearance for their position, spending authority over the referenced account number, and most importantly, available budgeted funds in the account they are using. The available transactions are:

1. Originate check requisitions.
2. Originate Purchase Orders, Blankets, and Agreements.
3. Originate Requisitions for Internal Services
   - Computer Store Purchases
   - Purchasing Stock Room Requisitions
   - Bookstore Purchases
   - Bureau of Conferences
4. Approve requisitions when more than an originator's approval is necessary.
5. Adjust Blanket Purchase Orders
6. Cancel Requisitions/Purchase Orders under controlled circumstances.
7. Originate budget transfer of funds between 2 six digit accounts or between 2 sub-code lines of an account.
8. View transactions in numerous formats.
9. Receive goods on a purchase order or refer received goods problems to the Purchasing Department for problem resolution.

D. Features of Campus Wide Transactions

- The campus-wide requisitions listed above must be processed in an on-line mode.
- There is no alternative such as the submission of a paper check requisition to the Controller's Office or a paper purchase order to the Purchasing Department.
- There is no alternative such as having the centralized purchasing department enter purchase orders for departments because the originator's position must be established as having spending authority over the accounts that are used.
- Completion of the transaction at the department level performs an instantaneous encumbrance and reduction of balance in the accounts that are used. Real-time means real control!
- When a department originates a purchase order to a contracted vendor and each line of the purchase order is under $500, the purchase order prints immediately on a laser printer in the Purchasing department.
- Purchase orders are processed in conjunction with a commodity table. The commodity table carries the position number of commodity-buyer so P.O. transactions are electronically routed to the proper buyer for review and approval.
- Transactions originated at the departments are electronically referred to the next appropriate approval station.

E. Specific Functionality for Business Offices

The Purchasing Department, Internal Services Department, and the Controller's Office have specific transactions for approving, suspending, and modifying requisitions. Additionally, they have other transactions for matching invoices to a purchase order, processing credits, releasing transactions for payment, requesting additional copies of purchase orders etc.

Buyers in Purchasing have capability for adding extensive text to any purchase order to stipulate contractual terms and conditions.

The Controller's Office

The Restricted Funds Section of the Controller's Office has the functionality to approve or suspend any requisitions drawn on restricted funds such as contracts and grants or agency accounts.

The Accounts Payable Section of the Controller's Office has capability to:

1. Release a payment on a check requisition.
2. Release payment for an invoice on a PO.
3. Suspend check requisitions back to originating department.
4. Modify addressing for check disbursement.
5. Apply credits to specific vendors or requisitions.
6. Maintain addresses for a vendor.

WHY U-BUY?

In the summer of 1986, our survey of the User-community indicated a universal growing displeasure with the paperwork processes involving check requisitions and purchase orders. Everyone was asking for help in controlling the burgeoning paperwork and in eliminating the tremendous time delays in receiving a check for an order or for a reimbursement. Purchase Order Processing took days just to get a purchase order to a vendor. The ordinary check requisition took 14 business days or more. At peak processing periods, it could be 20 days.

Our payments to vendors were late, early payment discounts were virtually non-existent. An order by an administrator for a dozen ball point pens required 2 signature approvals.

Executive management was insisting that functional managers control their budgets - but receiving a budget report 12 days after the close of the month was not conducive to good control. About one fourth for our departments had access to terminal displays of their budgets. Most of our departments, however, were creating "bootleg accounting systems", keeping track of their spending with annotated listing, index cards, or PC spreadsheet programs. The challenge of the 80's was to keep track of their fiscal operations with a "kludgy" set of unintegrated tools.

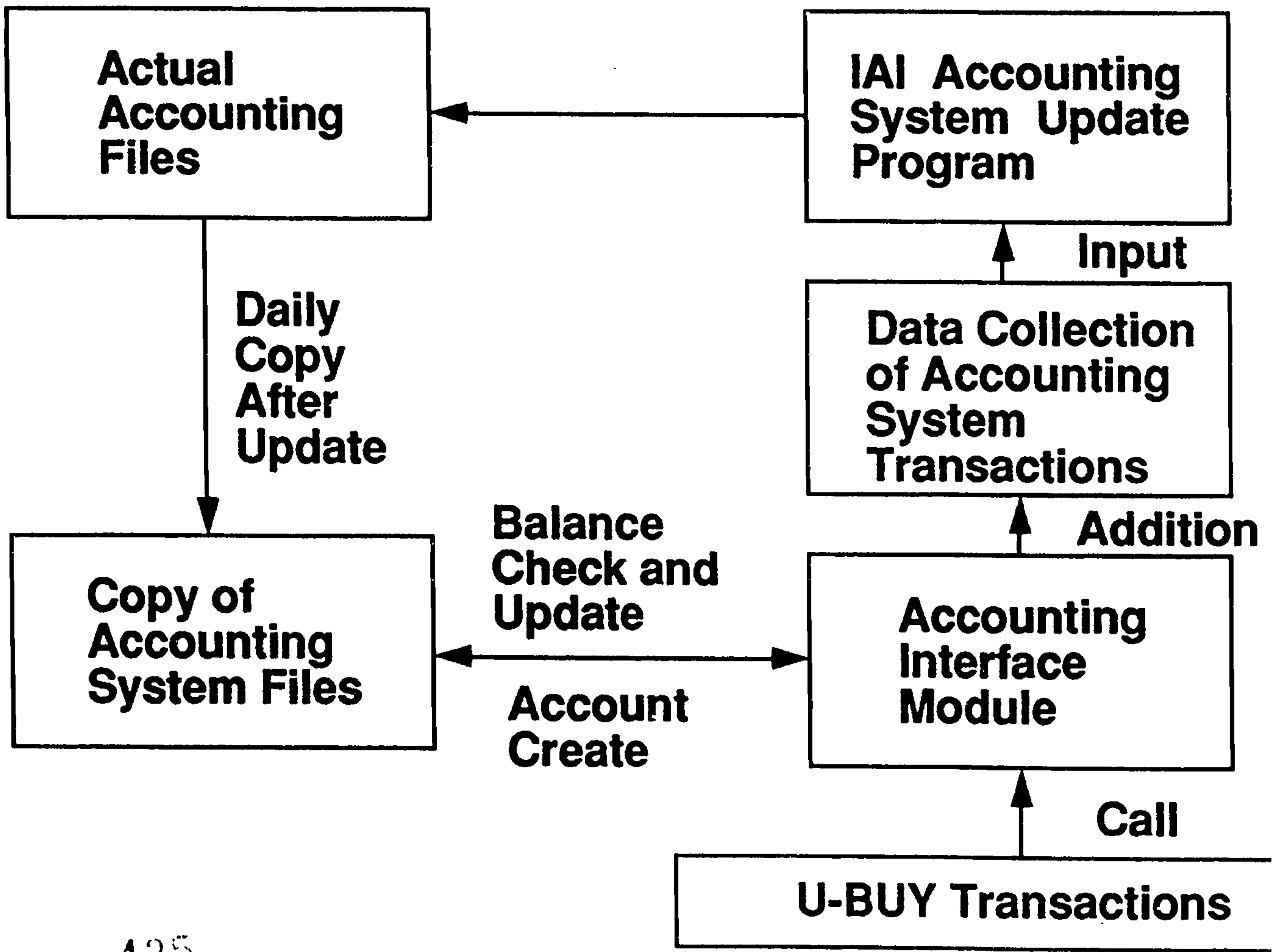
HOW U-BUY?

An annotated chronology will show some of the specifics of how this application was developed and the time-frame in which the product was implemented.

TIME

Fall	1986	Directors of Offices within the Financial Vice President's area met repeatedly with MIS. Result: General Systems Requirements
January	1987	Development of RFI/RFP
March	1987	Review Vendor Proposals
April	1987	Decision to develop product in-house and integrate with our environment.
June	1989	Developed Universal Position System as necessary components to provide a secure system environment. Develop prototype of requisition menus, transactions, and commodity tables. Complete front end design and development.
May	1987	Developed Electronic Signature File
June	1988	Establish Implementation Committees, Security Awareness, Education & Training, Publicity & Promotion, User Documentation and Connectivity. June 1988 All Committees Working
	1989	Financial Systems (Controller's Office), defining positions with account access. MIS - Detailed design and development of back-end components in system. i.e. Invoice Matching Receiving Problem Orders Processing Credits Centralized Laser Printing of PO's AP Release of Payments
Feb	1989	MIS, User Management, Internal Audit, External Audit convened to get total agreement on the matter of electronic signatures.
April	1989	Phase I went live - Next Fiscal Year Purchase Orders; On-line Budget Transfers of the Current fiscal year.
June	1989	Phase II implementation All Purchase Orders and Check Requisitions, and back-end components of system (No internal Charges)
October	1989	Purchasing Stockroom Internal Charges
January	1989	On-line Journal Entries for Charge-back
March	1990	On-line Computer Store Requisitions & Integration with the Info-Technology Inventory/Order system.
June	1990	Completion of U-BUY Year-end processing and special accrual logic
Sept	1990	Bookstore Internal Charges
Nov	1990	Bureau of Conferences Internal Charges

Real-Time Balances With Account System Integrity



What Were the Problems?

Anticipated:

1. U-BUY would be a whole new way of doing business and would require a great deal of change for a many of our departments and personnel.

2. It would be difficult to coalesce agreement in the Business Offices (Controller, Budget, Purchasing, Interal Audit), on the matter of approvals and electronic signatures.

3. Given the fact that we had no central receiving department, User department receiving would have to be simple with an electronic referral of unusual received purchase orders to a problem resolution function in the purchasing Department.

4. Problem-resolution and invoice matching of purchase orders in Purchasing would be very difficult to program because of the endless possibilities and accounting budget effects.

5. Job re-definition would be necessary in the Accounting and the Accounts Payable departments of the Controller's Office and in the Purchasing Department.

6. Academic department participation in training would be ignored by many.

7. It would be a major task to train 600 Users of the system.

Unanticipated Problems

1. Invoice matching and problem resolution in the Purchasing Department proved much more-time consuming than anticipated.

2. Requirements by the Purchasing Department, Buildings & Grounds representative were much more than we realized in respect to annotating orders and issuing change orders.

3. As an audit trail for information, the system was stamping the transactions with the position number of the employee who did the transaction. We had to change this stamp to include employee ID number for historical purposes.

4. Certain senior-level Users in the Business Offices had exposure to the installation of vendor packages at other universities. The experiences they encountered at other places was translated to negativity in anticipation of what we were about to do. So there were "Black clouds", (these critics have opted for silence or praise since U-BUY was implemented).

5. One function in the Business Office segment ignored our admonitions that the system would dramatically affect their operations and that some restructuring should take place. It's clear to the whole community that this area is a bottleneck that causes unnecessary delays.

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Survey of User Community

In July of 1990, we gathered statistics for the previous years' processing under U-BUY. We also surveyed the prime UBUY contact in 25% of our departments (excluding the business offices) and we learned a great deal.

1. We announced U-BUY to the general community in January 1989 seminars. On our survey we learned that nearly a quarter of our respondents questioned their ability to perform sufficiently under a new system when they heard that it would be coming. There was a good deal of anxiety in the User community.

2. It was the Users' perception that under the old paper system it took 14.4 business days to receive a check after the submission of a paper check requisition. With U-BUY, they perceive that they get a check in 7.2 business days after entering an on-line check requisition.

3. With a number of stops along the way for a paper check requisition, and a long delay in receiving a check, phone calls became the usual tool of expediting. In our survey, people reported they saved an average of 2 telephone hours per week, tracking down requisitions, invoices, purchase orders. Conversations between Departments, Purchasing, Budgeting, Accounts Payable resulted in an enormous amount of telephone traffic. If one department saves 2 hours a week, that's a 104 hours per year. When you multiply that by 130 departments it amounts to 13520 hours per a year. But phone conversations are between two people so we can double the number and see 27,040 hours of savings in phone conversations on our campus in one year. That's the equivalent of more than 3800 seven hour days. That is the opportunity for 15 years of increased productivity.

4. 65% of the survey respondents felt their computer and computer system knowledge had risen since U-BUY went live.

5. The survey question: Yes or No in a return to the old manual paper drive system received a resounding 'NO' with one threat of "I'd quit".

General Response by the User Community

The survey coupled with observations and conversations with the User community lead us to believe that the UBUY system has been fairly well received as a friendly system that helps people in the management of their budgets and the operation of their offices. When our plans for the UBUY implementation were announced in early 1989, one fourth of the Users had real reservations about whether or not they could meet the challenge of an on-line requisitioning system. It's a credit to many of the staff of the University that they met the challenge and exceeded their own expectations in a computer environment hitherto unknown.

UBUY spurred connectivity to the main frame and in many ways drove the resource components of Information Processing Support for training and Network Services for on-line connections. More importantly, it stirred imaginations and appetites of our employees who are now asking for on-line Payroll Time-Sheets, Personnel Action Forms (PAF's) and Building and Grounds Work Orders. It's apparent that the UBUY system is accompanied by a heightened awareness and use of information systems as a more viable communications medium.

UBUY as a prototype, represented a tall mountain to be conquered. However, having done this, the introduction of new on-line functionality for other applications will only be rolling hills and much easier to scale for technology and the User community.

It's necessary to say a few words about attitude in our experience of changing the way we do business. The project implementation was a major step for everyone. There were system bugs and problems, on occasion, but the overwhelming majority of the User community was understanding and patient. Not all, but most were sensitive to the complexity and ambitiousness of what we were all trying to achieve together. The spirit and cooperation of the community was an integral part of this successful UBUY Project.

UBUY is a unique product designed for Boston College. Behind UBUY are various system components and standards that have been carefully designed and developed over the past decade. These pre-existing home-grown components contributed greatly to the success of UBUY. UBUY in a sense was just the frosting on the cake, the sweetest part for all the community to use.

SMALL-SCALE DOCUMENT IMAGING

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ABSTRACT

Document imaging is the process of transforming printed text, pictures and figures into computer-accessible form. While this technology certainly offers dramatic opportunities for enhancing office automation, vendors have been very quick to promote imaging as the ultimate solution for document management problems involving both space and personnel.

A hands-on evaluation of PC-based document imaging was conducted to gain a better understanding of the issues involved. Although we were not successful in our attempt to fully duplicate commercial system functionality, observations from this assessment may be helpful in deciding how imaging should be applied within your organization.

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Small-Scale Document Imaging

Daniel V. Arrington, COAP

Introduction

Estimates suggest 95%[1] of the 1.3 trillion documents stored in United States offices today[2] are saved in the form of paper and of these, only about 1% are available in various computer formats[3]. At the same time, concerns about declining fiscal conditions are beginning to impact hiring and spending patterns in many higher education institutions. These observations translate into an indisputable need to deal with increasing volumes of paperwork before the situation becomes completely uncontrollable.

Recent advances in automation technology have spurred growing interest in the idea of using computers to resolve increasingly critical problems associated with processing, saving and using paper documents. Every month, more and more vendors[4] are touting a process called document imaging as a solution to ubiquitous paper-related problems.

We became interested in imaging after seeing several vendor demonstrations and decided to try duplicating imaging system functionality with off-the-shelf personal computer components. This paper describes insights obtained during a hands-on evaluation of imaging technologies and techniques.

Imaging

Document imaging is a way to get printed material into a computer. The imaging process involves transforming paper documents into computer-compatible files which can be managed and used in a distributed system environment. As awareness of document management increases, advantages associated with the concept of automated paperwork become more compelling. In fact, although envisioned benefits are extraordinarily desirable, they have been so elusive that knowledgeable administrators spend little time thinking about creating a paperless office with computers. And yet ...

Traditional document storage methods are unquestionably resource intensive and expensive. In response to these problems, discussions commonly cite space, accessibility, security and integrity as some of the issues to be resolved by imaging systems[5]. Imaging offers real possibilities for savings as areas previously used to store documents are converted to laboratories or offices. Further benefits of automated document storage can be obtained only through the shared processing made possible by local area networking. Projected savings are supposed to accrue through improved efficiency as people locate and retrieve documents faster and easier than they can with traditional systems. In addition to

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[1] David O. Stephens, "What's Ahead for Records Management in the '90s?," The Office, January 1990, p. 135.

[2] David E. MacWhorter, "Image Is the Next Information Frontier," The Office, April 1990, p. 78.

[3] David T. Bogue, "Micrographics: Its Once and Future Technology," The Office, January 1990, p. 71.

[4] John A. Murphry, "Document/Image Management Systems: Their Advantages Are Not Optical Illusions," Today's Office, April 1990, p. 40.

[5] David E. MacWhorter, "Image Is the Next Information Frontier," The Office, April 1990, p. 78.

rapid retrieval, simultaneous access to the same document by different workers promises opportunities for literally revolutionizing document processing methodologies.

Imaging system disadvantages, both apparent and subtle, must be anticipated and resolved if an imaging application is to be successfully used in any organization. With complete turn-key imaging systems selling for hundreds of thousands of dollars, the most obvious problem is one of cost. Other, far more threatening difficulties include: employee resistance to change; problems typically associated with automation of manual practices and procedures; dangers inherent in over-dependence on a single vendor or on a vendor's proprietary system; and problems caused by unrealistic expectations - like the idea that document imaging will finally lead to the paperless office.

ALTERNATIVES

The problems described thus far are quite real and document imaging sounds promising but it is certainly expensive and will likely introduce new problems to be solved. So what is the most practical response?

Well, there are only two choices. Either continue to use traditional methods for storing and archiving documents (*ie.* stacks and piles, folders, cabinets, *etc.*) or implement something new. Advantages and disadvantages of alternative media like microfiche[6] are well known and while a few developments in fiche are still forthcoming, this is a mature technology which has done little to reduce dependence on paper documents. Continued use of microfiche and automated filing equipment is assured but the question to be asked is: "Are these enough to cope with increasing volumes of paper?".

Before document imaging can be used to solve paper processing problems, choices as to extent and approach remain to be made. Personal computers and a local area network may provide a reasonable alternative to commercial imaging systems. While to a certain extent, it is possible to pick and choose among vendor offerings, system components cannot be purchased like delicacies from an imaging buffet without fully understanding the ramifications of each decision.

This investigation into document imaging was intended to duplicate the functionality of commercial imaging systems with readily available PC hardware and software while avoiding major programming efforts. Adoption of these project constraints restricted our attention to issues of image capture, storage and retrieval. Complications associated with operational aspects of LANs (local area networks), groupware, and database maintenance are acknowledged but were not actively investigated.

SMALL-SCALE IMAGING

Two very distinct concepts are possible when talking about document imaging. The most common idea is to make a digitized duplicate of a document. Under this approach a scanner is used like a camera to take a "picture" of the original, saving text, line-art

[6]Steve Davis, "Micrographics is Increasing Its Exposure," Today's Office, April 1990, p. 46.

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drawings and photographic figures as a single graphic file. Text imagery on the other hand, depends on optical code recognition (OCR) to convert scanned text into standard word processing documents while intentionally disregarding drawings and figures.

System requirements for image capture workstations for both methods are quite similar. Hardware configurations consist of a powerful microcomputer, scanner, laser printer, and some form of high-capacity data storage device such as WORM (Write-Once, Read-Many) optical drives. Additional imaging system requirements include a LAN for distributed access to the image database and software designed for image capture, indexing, database maintenance, and *ad hoc* selection of specified images.

The list of system hardware components employed in this exercise included IBM PS/2s, an IBM AT, a Hewlett-Packard (HP) ScanJet Plus scanner and LaserJet III printer, with an external IBM WORM drive. Evaluated software consisted of Microsoft's *Windows 3.0*, *Scanning Gallery Plus* from HP, Precision Software's *Superbase 4 Windows*, Caere's *OmniPage/386* and *askSam* from askSam Systems. Each of these products was used because they were already on-hand and mention of a specific item should not be taken as a recommendation, although with a single exception, all have been named in leading industry publications as being among the best examples of their kind.

GRAPHIC IMAGERY

As mentioned, graphic document imaging can be likened to taking a photograph of a document. Everything on the original page including handwritten notes, date and time stamps, any alterations, figures, drawings and typed or printed text is saved exactly as it exists when the document is scanned. Like a photograph, once the image has been acquired few actions beyond displaying or printing the image are possible.

Scanning Gallery Plus is a *Windows*-based image capture program supplied with HP's ScanJet Plus. As this paper was being prepared, we received an upgrade to version 5.0. This version offers substantial improvements over the previous program with *Windows 3.0* compatibility, an integrated paint program, easier operation and options for saving scanned images in established graphic formats including .TIF, .PCX, and *Windows* Clipboard.

Capturing an image requires two major steps after placing a document under the scanner cover. After selecting the area to be captured from the *Preview Scan* screen representation, *Scan Region* actually captures and saves the document image as a file. Operator choices range from the type of image processing used for photographic figures to exposure characteristics and image scaling.

The principal problem related to graphic imagery is one of file size. Graphic TIFF images are large. Since every part of the page is saved regardless of the presence or absence of ink, TIFF file size varies directly with resolution and the size of the area being scanned. An image of a full page scanned at 300 dpi (dots per inch) can be expected to reach a size of a megabyte or larger. The scope of this observation becomes clearer by

envisioning a 115Mb hard disk worth $2,077 (State discount price for Florida's universities) holding about 100 page images. Obviously, far too expensive for serious consideration in a production environment, this fact is a driving force behind growing interest in optical mass storage devices.

The importance of archiving graphic document images on uneditable optical media cannot be overstated but a brief warning is in order. While it is true that once saved on an optical cartridge an image cannot be easily modified, it is quite simple to alter a TIFF file using any number of graphics paint programs **before** being copied to the WORM. Administrative procedures with traditional checks and balances should be sufficient to deal with this possibility but organizations are entitled to know about prospects for unauthorized image manipulation.

Large file sizes also have deleterious effects on the amount of time needed for saving, retrieving, displaying and printing these images. All of these issues lead to system requirements for powerful microcomputers and peripherals which drives up imaging costs. Other problems are associated with the fact that the appearance and composition of a document has direct effects on scanning variables. Not all image enhancement processes offered by *Scanning Gallery Plus* are acceptable for a particular figure. Some degree of operator experimentation and experience is often needed to acquire an acceptable image which extends the time needed to complete the capture process.

Graphic imagery advantages are compelling. Relatively inexpensive hardware and software can be used for total preservation of original document appearance. The absolute value of digitized and electronically-stored images can only be inferred at this time but may actually be worth more than the original documents because they can be copied and restored for years without any possibility of appearance degradation over time. TIFF files also offer the possibility of post-capture processing by OCR software which further heightens the potential value of scanned graphic images.

TEXT IMAGERY

Text imagery is based on the premise that words are the most important aspect of a document. Optical character recognition provides a means of scanning printed text to create word processing documents. Although there are growing numbers of OCR programs capable of accurately interpreting a printed page of text, on the basis of speed and accuracy *OmniPage/386* has been a consistent winner in head-to-head evaluations of OCR software[7].

OmniPage is a page recognition program capable of working with single or multiple-column pages and successfully handles a wide variety of fonts, type styles and text sizes. Users have the option of performing the recognition process as each page is scanned or using TIFF images after they have been captured. If recognition is done as each page is

[7]Bill O'Brien, "OmniPage/386," in "OCR Software Moves Into The Mainstream," Lori Grunin, ed., PC Magazine, October 10, 1990, p. 315.

scanned, an opportunity to incorporate a number of separate pages into the final document is offered.

The process begins as *OmniPage* interprets the layout of the page, blocking out paragraphs and non-editable graphic areas, leaving a painted page image on the screen. Text recognition converts the bit-mapped image to ASCII characters and finally, a transitional editor presents text with known errors shown by tilde (˜) marks for final editing. Be assured there will be errors. Appearance quality of the original (*e.g.* smudges, fingerprints, fuzzy copy, dot-matrix print) has nearly as disastrous an effect as does skewed placement or a dirty scanner glass. Other errors will be created by underlined descenders like the letters q, y, and p in the words quality and mapped, as well as outsized or otherwise unrecognized fonts[8].

Performing accurate OCR takes substantial amounts of time. Beyond problems already described, the chief difficulties of optical character recognition have to do with efforts required t locate and correct errors in the resulting text. Our work with OCR suggests nearly halı of all errors go unrecognized and therefore are not indicated with tilde marks which necessitates painstaking editing. In the worst case, editing must be accomplished with the original page immediately at hand. This function can take far longer to complete than do the scanning and recognition processing steps combined.

To their credit, text files are much smaller than graphic files. The same 115Mb drive (remember - around 100 graphic page images) would hold more than 23,500 single-page (5Kb) documents. Text imagery makes it possible to use text captured from extensive printed resources without time consuming and even more error-prone retyping. Normal word processing experience provides the only skills needed to edit and use these documents.

Since text files created by OCR are no more than word processing documents, any PC able to satisfy the organization's word processing needs will work for text imagery users. Users of graphic files on the other hand, must have relatively powerful PC workstations simply to handle the load imposed by large files and graphics processing requirements.

ROLE OF DATABASE MANAGEMENT SYSTEMS

If the only purpose of the imaging process were to preserve documents, then the previous discussion of capturing graphic and text images would be complete. However, the ultimate value of imaging will be realized only when personnel and other resources are diverted from activities revolving around filing, finding and moving paperwork to activities designed to enhance extraction and use of information contained in each document.

Database management systems or databases, are programs designed for rapid retrieval of specific records on the basis of data contained in one or more fields within each record.

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[8]Lori Grunin, "OCR Software Moves Into The Mainstream," PC Magazine, October 10, 1990, p. 320.

Once graphic images and OCR-processed text documents have been saved as files, a database is needed for selective retrieval of indexed data along with images.

GRAPHIC DATABASE - *SUPERBASE 4 WINDOWS*

Few database products are capable of dealing with graphic images and even fewer are able to display an image and field data simultaneously. *Superbase 4 Windows* is a programmable, *Windows 3.0* compatible, product offering relational traits and the ability to show a graphic image in a pre-set window. Operating at several levels of programming complexity, *Superbase 4* is able to reference and display external TIFF files with surprising ease.

If scanning a document page is counted as the first step in the imaging process, indexing resulting image files comprises the second step. It is possible to minimize the impact of this process by creative programming (*ie.* point and click to select a specific image file or automatically updating a field with today's date) but other information to be used as a record index must be entered manually. Compromise between system flexibility - many record fields, and entry speed - fewer fields, will be ruled by user-designed system constraints.

Graphic databases share certain disadvantages which in this case are related to graphics processing requirements making a strong microcomputer a must. Even still, it takes a fair amount of time to paint the screen with a full page image and if the number of hand-keyed data fields is limited, database search options are limited proportionately. In addition, the programming needed to ensure effective implementation infringes on our objective of avoiding major development efforts.

At the most basic level, associating graphic images with *Superbase 4* database records is quite easy. Given the claimed ability to create very large databases, *Superbase 4* may be appropriate for a number of diverse imaging applications and since a network version of the database is available (but was not evaluated), this product fulfills many of the basic needs for managing a graphic image database.

TEXT DATABASE - *ASKSAM*

askSam is a programmable, DOS-based, free-format database with limited hypertext capabilities. This product can automate the process of distinguishing between an extensive number of ASCII text files and unlike traditional database management systems, is able to locate all occurrences of specific words by employing full-text search algorithms.

Unfortunately, although *askSam* is an extremely innovative product, its disadvantages seem to preclude use as an integral component of a document imaging system. Text files must be converted to special formatting and some programming with a non-standard language is required for most effective use of *askSam*. Furthermore, while *askSam* is able to work with graphic images after a fashion, it does so by launching someone else's graphic display program from within the database. This approach precludes a simultaneous view of a graphic image and associated database information.

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To it's credit, although one of very few free-format databases, *askSam* is an inexpensive application. System requirements are quite modest unless graphic display options are used and a network version (not evaluated) is available.

WORM ARCHIVING - IBM's 3363 EXTERNAL WORM DRIVE

Optical data storage is especially attractive in document imaging applications because individual optical disk cartridges can hold hundreds to thousands of megabytes of data. Daisy-chaining (interconnecting) multiple drives and optical jukeboxes (single drive with multiple cartridges) can extend this capacity to hundreds of gigabytes of on-line mass storage. On the basis of published articles, many of the following observations might be resolved simply by using a better example of this critical peripheral.

IBM's 3363 WORM is a *slow* device. Reports on the effects of daisy-chaining SCSI devices to achieve greater storage capacity suggest access times across chained WORM drives would decline significantly below those experienced with our configuration. Even though our drive has been installed for two years, WORM technology is still relatively immature with arguments raging about purely technical issues[9] and suffers from a general absence of acceptable device drivers. At 200Mb per single-sided cartridge, this drive has the smallest capacity of any WORM drive currently available. The industry standard for 5.25" optical media is somewhere between 500 and 600 megabytes per cartridge.

However, because storing document images on optical media can preserve the unaltered appearance of original documents for years (claims of data life expectancy on optical disks range from thirty[10] to a hundred[11] years), and because the cartridges themselves are impervious to many conditions which would easily destroy magnetic tapes or disks, WORMs are considered extremely attractive mass storage devices. The write-once characteristic of this optical technology is conducive to archiving records and creates relatively fool-proof audit trails but questions about the legal validity[12] of WORM-archived originals remain unanswered.

OBSTACLES TO SUCCESSFUL DOCUMENT IMAGING

Thus far, issues of image capture, indexing and storage have been presented. These steps, though crucial, appear to represent no more than a beginning for the document imaging process. This attempt to duplicate commercial imaging system functionality has not been successful in devising a working alternative but has provided important insights into relevant issues. While technical aspects of image capture appear to be straightforward, at

[9]David A. Harvey, "State of the Media," in "State of the Art: Magnetic vs. Optical," Jane Morrill Tazelaar, senior ed., Byte, November 1990, p. 275.

[10]David Kalstrom, "Getting Past the 'Write-Once' in WORM," IMC Journal: Publication of the International Information Management Congress, Jan./Feb. 1990, p. 16.

[11]David A. Harvey, "State of the Media," in "State of the Art: Magnetic vs. Optical," Jane Morrill Tazelaar, senior ed., Byte, November 1990, p. 275.

[12]Emily Leinfuss, "When Optical Storage Courts Danger," inset in "USAA's Image of Success," Datamation, May 15, 1990, p. 80.

least three major management issues (image acquisition ramifications, quality control and document management) deserve further comment.

Document imaging can obviously save time and money by reducing filing errors and making record retrieval faster but the impact of shifting human resources is seldom mentioned in vendor presentations. Many workers will have to be trained from the ground up and that training may have to begin with "This is a PC ...". And even after trained users are available, people responsible for finding filed documents will have to be assigned new tasks as efforts are increasingly dedicated to capturing and indexing images. These observations are especially noteworthy because they indicate the kind of managerial skills which will be needed to guide an organization through the sort of substantial changes[13,14] required for the most effective implementation of imaging technology.

Operators of image capture workstations will have to develop judgmental skills to assure image validity. They will have to make decisions about what portion of a scanned image to save and will have to make sure variables employed during the scan result in an accurate copy. Naturally, anything that requires this sort of attention will take more time per execution than would a mass production approach.

High volume or production imaging systems are dependent on rapid mass scanning and retrieval capabilities. Our system took an average of four minutes to complete graphic image captures with HP's *Scanning Gallery Plus* (4.0). Text imaging wasn't any faster since four to five minutes were needed to scan and interpret each page. However, unlike *Scanning Gallery Plus*, *OmniPage/386* can handle multiple page documents with the aid of HP's automatic document feeder which at least offers the promise of batch scanning possibilities.

Before any database can be used with reliance, users must have full confidence in the validity of all system data. Regardless of the document imaging approach (graphic or OCR text), inaccuracies caused by scanning problems or document variations makes it seem reasonable therefore to suggest that operators MUST proof each image and edit OCR documents **before** files are finally committed to the document imaging system. Yet another instance of time-consuming activity seldom mentioned in imaging system demonstrations.

Then there is the question of what to do with existing stockpiles of paper records. There are arguments in favor of scanning everything at once or scanning nothing but new documents but the most practical compromise might be to scan everything new and catch up with archived documents as circumstances and resources allow.

A recent review of document management software described systems designed to manage text (and/or images) which have been scanned from paper documents and saved as cross-

[13]Roger E. Wasson, "Organizing for Future Technologies," Datamation, April 1, 1990, p. 93.

[14]Gary H. Cox, "Technology's Rewards Without the Risks," Datamation, February 1, 1990, p. 69.

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referenced computer files[15]. While we were not able to review any examples of this new class of software, their reported capabilities seem to address the most important deficiencies of our database investigation. *Marvin 3.0* from ImageTech, Inc. may be worth serious consideration because it is *Windows*-based but with a list price of $9,500 to $33,500 for a multiuser version[16] it is not a trivial purchase and will have to be subjected to an extensive hands-on evaluation before adoption.

SUMMARY

Our strategy for home-grown microcomputer imaging suffers from at least three critical flaws. Because *Scanning Gallery Plus* offers no option for batch processing, no capability for volume processing of graphic images exists. Although another vendor's product would probably be satisfactory, our WORM disk drive is too slow and too small to be of any significant value in a high volume application like this. And finally, because our databases do not offer any particular ability to manage the proliferation of scanned images and OCR documents expected in an imaging environment without special programming, consideration has to be extended to specific multiuser document management software.

Document and image management is clearly the key concept for successful imaging applications. As noted, several deficiencies of our off-the-shelf components can be offset by using better products and still others may be resolved by technological innovations within another year or so. Organizations considering adoption of imaging as a strategic application would be well advised to establish a monitoring program to watch improvements in mass storage technology and document management programs.

In the meantime, the products used in this exercise are perfectly adequate for project-level applications. Our office will continue to rely on functions provided by this hardware and software to develop innovative solutions as needs arise. Document imaging is unquestionably important enough for substantial investment as long as proprietary or single-vendor systems can be avoided.

Institutions suffering from the paperwork processing problems outlined in this discourse stand a good chance of becoming involved with imaging within the next few years. Despite vendor hype, innovations such as document imaging must explicitly address problems in your organization before they can be considered as solutions. A judicious mixture of programmed flexibility and calculated response is helpful in any introduction of advanced technology, however the ultimate secret for a successful implementation of new technologies will always be to balance organizational expectations and needs against available resources. Good luck.

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[15] Chet Schuyler, "Document Managers Bring Law and Order," PC Week, October 1, 1990, p. 93.

[16] Op. Cit., p. 94.

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ACKNOWLEDGEMENTS

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CLIENT-CENTERED STRATEGIC PLANNING

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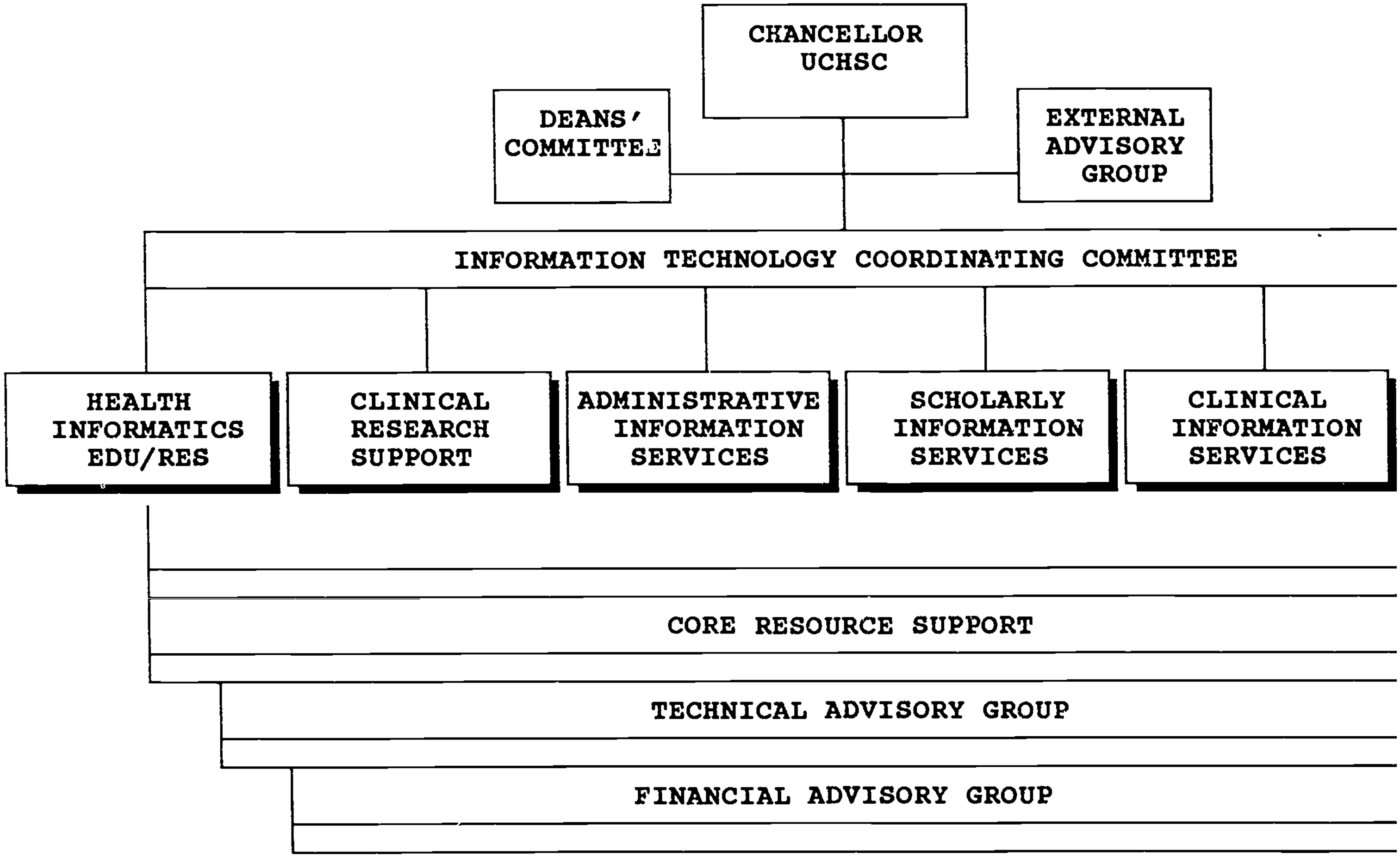
The University of Colorado Health Sciences Center is beginning a client-centered strategic planning process to relate investments in information technology to the support of campus goals. User groups are being established for the major areas of campus activity. These groups will define present and future needs related to their area of specialty and interest. A coordinating committee will compile these results and review existing strategic plans for each of the schools and for the campus administration. The coordinating committee and service units will collaborate to produce the strategic plan for information technology for the campus. The goal of the process is to provide integrated client-centered planning and a structure for implementation.

The model is based on a planning structure at Columbia Medical Center in New York. Both have a large number of relatively autonomous units and the hospitals are separate corporations, requiring intense interaction and cooperation to accomplish the goals of each.


CHANCELLOR UCHSC
DEANS' COMMITTEE
EXTERNAL ADVISORY GROUP
INFORMATION TECHNOLOGY COORDINATING COMMITTEE
HEALTH INFORMATICS EDU/RES
CLINICAL RESEARCH SUPPORT
ADMINISTRATIVE INFORMATION SERVICES
SCHOLARLY INFORMATION SERVICES
CLINICAL INFORMATION SERVICES
CORE RESOURCE SUPPORT
TECHNICAL ADVISORY GROUP
FINANCIAL ADVISORY GROUP

INTRODUCTION

The University of Colorado Health Sciences Center in Denver is implementing a planning process that is client-centered. User groups are being established for all major areas of on computing and other types of information technology. These groups will define present and future needs related to their area of specialty and interest. The goal is to provide an integrated client-centered planning effort and a structure for implementation.

The Health Sciences Center is one of four campuses of the University of Colorado. Each campus has a Chancellor, who reports to the President. There are two vice chancellors on campus. One, though not having the title, functions as Executive Vice Chancellor. The second is the Vice Chancellor for Academic Affairs. The Associate Vice Chancellor for Information Systems reports to the Executive Vice Chancellor. Information Systems includes Administrative Data Processing, Telecommunications, the Computer Information Center, Data Communications and Bioengineering.

There are schools on campus: the schools of Dentistry, Medicine, Nursing, Pharmacy, and the Graduate School. A number of Allied Health degree-granting programs are also on campus. Unlike general academic campuses, the Deans do not report to the Vice Chancellor for Academic Affairs. They report directly to the Chancellor. Academic health science centers have been described as a "loose confederation of power." This decentralization of power is even more evident in the School of Medicine, where department Chairmen actually have control over more funds than the Deans. This is primarily due to the fact that only 19% of the total campus budget comes from the State. The remaining 81% is from grants, contracts, gifts and revenue-producing activities. There is a constant tension regarding who has control of funds, especially those produced by indirect cost recovery (ICR). This was intensified recently by a "white paper," authored by the faculty, and calling for a greater per centage of ICR monies to be returned directly to the department producing them.

This is very pertinent to our planning effort, as I will point out later.

Rationale for a Client-Centered Approach to Planning

The most compelling reason for a client-centered approach to planning for information technology is that it emphasizes **information**, rather than technology. Secondly, investments in technology are determined by actual and projected needs of the clientele being served.

> "Management must determine whether the recommended changes are simply to satisfy the desires of purely technically oriented data processing individuals, who often are more interested in implementing the latest technology than satisfying the information needs of end users, **or** to satisfy the needs of end users, who are concerned less with technology than simply getting information when they need it in a form that is useful."[1]

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On the very practical side the clients provide funding, either directly or indirectly. Consequently, staying close to their needs provides a much broader base for support.

PROGRESS ON PLANNING FOR INTEGRATED INFORMATION MANAGEMENT

For almost a decade several academic health sciences centers across the country have committed themselves to implementing integrated academic information management systems (IAIMS). Planning at the University of Colorado Health Sciences Center is done in this context, although it is a goal for us and not currently implemented. IAIMS is a concept that comes from a report funded by the National Library of Medicine (NLM) in conjunction with the Association of American Medical Colleges (AAMC). Published in the 1982 October issue of the Journal of Medical Education,[2] the report laid the groundwork for planning for the use of information technology in academic health sciences centers.

Originally, the NLM selected four academic health sciences centers in 1983 to investigate the IAIMS concept and to develop prototypes. Currently, there are eleven institutions receiving funding from NLM for planning, modeling and implementation.

The thrust of the IAIMS initiative is to provide a coherent plan for the development of campus computer and telecommunications networks and services, which will provide faculty, staff and students with efficient access to relevant databases (e.g. library files, patient information, research files, remote databases such as MEDLINE, etc.), and provide the institution with a significant strategic tool to assist in achieving its objectives. Separate, de-centralized computer operations are recognized and minimal control is exercised over processing. IAIMS maximizes control over networking. This assures the necessary blend of autonomy and coordination.

Benchmarks of Information Technology Activities

All four campuses are now connected with fiber optic. Almost all buildings on the Health Sciences Center campus are linked with fiber.

In 1986 the Chancellor appointed a Computing Advisory Board to advise him on planning and expenditures for computing. Through various sub-committees, the Computing Advisory Board was instrumental in preparing network protocol standards, authoring a document to

establish the Computer Information Center, selecting electronic mail software, and sponsoring a Medical Informatics Seminar Series. One of the first projects was to prepare a manual on ergonomics for managers and purchasing agents. One of the last accomplishments was to recommend the client-centered planning approach to the Chancellor.

In 1988 a planning grant was submitted to the National Library of Medicine. This was approved, but not funded. The grant preparation process did, however, bring together a nucleus of individuals who have continued to work towards integrated planning.

In 1989 the Chancellor created the position of Associate Vice Chancellor for Information Systems. Originally charged with total campus computing service, for a number of reasons, it is now limited to administrative computing.

Two events in 1990 will have a significant impact on the computing environment at the Health Sciences Center. The Financial Reporting System was outsourced to the University's central computing system in Boulder. Also, the University Hospital was converted to a private, not-for-profit institution with its own President and Board. The Hospital is now in the process of hiring its own Chief Information Officer and transferring computer operations. This is of major concern, since the campus mainframe is currently operating at only 33% capacity, including the hospital applications.

DESCRIPTION OF PLANNING PROCESS

In the Spring of 1990 the Computing Advisory Board charged me with preparing a draft of a strategic plan for information technology on campus. In May I submitted a concept proposal, recommending that we use a modified model of the program at Columbia-Presbyterian Medical Center in New York. The campuses are similar in that they both have a large number of relatively autonomous units and in both cases, the hospital is a separate corporation, requiring intense interaction and cooperation to accomplish the goals of each.

The Information Technology Coordinating Committee is the overall steering committee and its Chair reports directly to the Chancellor. Feeding information to the Coordinating Committee are representatives from the client groups, the key feature of the model. There are six client groups: Health Informatics Education/Research, Clinical Information Systems, Scholarly Information Systems, Clinical Research Services, Basic Science Support, and Administrative Information Systems.

Health Informatics Education/Research. This group is concerned with the use of computers in health science education, information and computer literacy, and the broad applications of computing in the practice of medicine.

Clinical Research Services. This client group is made up of individuals interested in downloading subsets of data from the local hospital information system for use in clinical research.

Scholarly Information Systems. The main focus of this group are the information systems provided and planned by the Library, including network access to an online catalog, and a gateway to a third-party vendor for twenty-four hour per day access to the MEDLINE database. It includes access to full-text databases.

Clinical Information Systems. The chief emphasis of this group is the development of the hospital information system at University Hospital.

Basic Science Support Services. Needs of this group of faculty and students are primarily related to scientific computing, although fairly extensive database management capability is required.

Administrative Information Systems. In addition to the traditional administrative systems (e.g. personnel, payroll and purchasing), this group includes departmental administrative and school-specific applications.

Information Technology Coordinating Committee. This Committee has primary responsibility for planning and implementation, keeps the Chancellor, Vice Chancellors and Deans informed of plans and secures their approval. Heads of service units are members of this Committee, as well as a representative from each of the User Groups.

Technical Advisory Group. The Technical Advisory Group consists of members of the former Computing Advisory Board. When this planning process was initiated, it took the place of the Computing Advisory Board. It provides technical expertise to each of the User Groups and to the Information Technology Coordinating Committee. A member of the Technical Advisory Group is assigned to a client group. Each client group has a representative on the Information Technology Coordinating Committee.

Core Resource Support. This group is comprised of representatives from each of the institutional support units that provide computing and related resources and services. Telecommunications, Instructional Computing and the Computer Information Center are examples.

Financial Advisory Group. The Financial Advisory Group will provide fiscal planning expertise to all entities in the planning process, primarily to the Information Technology Coordinating Committee. It will be composed of a representative from each of the Deans' offices and an individual from the Chancellor's Budget Office.

PRESENTING THE PLAN TO THE CAMPUS

Following acceptance by the Computing Advisory Board, the concept was presented to the Chancellor for his approval. He appointed me as of Chair of the Coordinating Committee. At that point we compiled a list of faculty members and others for "direct marketing" in each of the schools. Brief fifteen-minute presentations were made in the offices of these selected faculty to members explain the concept, elicit their support and to gauge the degree of enthusiasm we might expect before approaching the Department Chairs and the Deans. Next we met individually with the heads of the various computing clusters on campus, in some cases LANS and in others minicomputers.

Only after we had contacted important users and computing centers did we meet with the Deans and Vice Chancellors, again on an individual basis. Now we were ready to present to the bi-weekly meeting of the Chancellor's staff, Deans and Vice Chancellors. The groundwork paid off. Already having the individual commitment, the approval of the group was assured.

The School of Nursing, due to the leadership of their Director of the Center for Nursing Research, had already incorporated planning for information technology in their School's strategic plan, completed in October 1990.

The School of Medicine has strategic planning groups for seven different areas. A presentation was made to the chairs of these groups and members of the information technology planning team will be working with each of the seven groups to assess the need for information technology support.

The Faculty Senate of the School of Medicine has recently made the decision to form a special planning group devoted exclusively to strategic planning for information technology.

Meetings are scheduled in December with faculty of the Schools of Dentistry and Pharmacy. Following these sessions, focus groups for each of the six client groups will begin.

STRUCTURE FOR IMPLEMENTATION AND FUTURE PLANNING

Recently, the Committee for Academic Programs and Planning issued a report containing a strong recommendation for the Office of Academic Affairs to assume responsibility for planning for information technology. Presently, the position of Vice Chancellor for Academic Affairs is vacant. How this will affect the timing of our planning is still unknown.

One of most important issues we will be addressing is the relationship between the Department of Information Systems and the computing needs of the academic community. Units of Information Systems (e.g. Telecommunications) provide part of the Core Resource

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Support. However, traditionally, they have not been charged to serve the needs of the Schools. Rather, they have concentrated almost solely on administrative systems.

Once our plan is complete, and representative of clients needs, "...management must ... be prepared to make the necessary capital investment in true integration technology. The investment must be viewed as a contribution toward achieving the long-rang strategies and goals of the entire organization."[3]

CONCLUSION

A longer time period is required for planning when a client-centered approach is used. All participants should be aware of the balance required between expressed client needs and the necessity of time-constrained management decisions. For the long term, greater involvement of clients in the planning process increases the chances of continuation of program. Addressing specific needs of clients facilitates the documentation of the success of planning and implementation.

Client-centered planning will help a campus to maximize its investment in information technology, ensure integrity and availability of data, and relate planning and expenditures to activities directly supporting campus. It provides a setting for truly integrated planning.

1. Lemon, Robert and Crudele, John. "Systems Integration: Tying it all Together." Healthcare Financial Management, June 1987, p. 53.
2. Matheson, Nina. "Academic Information in the Academic Health Sciences Center." Journal of Medical Education, October 1982, v. 57, no. 10, pt. 2, pp. 1-120.
3. Lemon, Op cit, p. 53.

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A Degree Audit System Implementation in a Distributed Environment

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Abstract

Cuyahoga Community College (CCC) and Systems and Computer Technology (SCT) have developed and implemented an Advising and Graduation Information System (AGIS). This information system centers around a powerful PC-based degree audit application, which relies on background micro-mainframe communications to retrieve both student records (academic history or transcript) and degree/catalog information from "authority" databases.

Because of the PC architecture and network scheme, the AGIS application is highly interactive - allowing views and browses of the authority degree catalog, realtime audits during counseling sessions, and "degree shopping" inquiries. The second phase of the project will deliver a batch or "distance advising" function which will distribute automated degree audit processing and mailing capability to strategic LAN based servers and laser printers throughout the student and academic support areas of the College. The highly portable nature of the application will allow for the possibility of widespread automated faculty advising.

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Introduction

Similar to other papers found in the Cause 90 Proceedings, the authors wish to tell a story. The story is about the development and implementation of a software application package called AGIS (Advising and Graduation Information System). AGIS is primarily a degree audit system; but, as the name implies, AGIS is also an information system targeted for users in the areas of counseling, admissions and records, and potentially all faculty involved in student advising.

AGIS was developed at Cuyahoga Community College, a two-year institution serving the Greater Cleveland metropolitan area. Cuyahoga Community College is composed of three campuses and a district office serving a diverse student population, with typical fall term enrollments near 25,000. The College has a long-standing partnership with Systems and Computer Technology Corporation; it is through this resource management partnership that AGIS, as well as many other information, network, and data systems initiatives have been devised and developed.

The balance of this story will describe the AGIS development effort at Cuyahoga, and the outcomes we have experienced. We will describe our own efforts against the background and history of degree audit systems, identify our own development strategies, describe the components of the AGIS system, and finally end with a summary of our achievements along with a laundry list of future goals or milestones in the AGIS project.

Background

Winston and Endler (1984) have provided a concise discussion of automated advising systems found in higher education. The first computerized attempts at matching a student's course history with a corresponding educational objective or degree program occurred in 1968 at the University of California at Berkeley. Very soon after this Purdue University began to produce rudimentary Academic Progress Reports from the computer. In the mid 1970's both Brigham Young and Georgia State universities had built comprehensive mainframe applications which produced degree audit and advising reports to serve a large portion of their undergraduate communities (c.f. Spencer et. al., 1983).

Both the Brigham Young Advising by Computer (ABC) and the Georgia State Programmed Academic Curriculum Evaluation (PACE) system were notable in that they defined a complete language or table design into which the college's catalog of graduation requirements and degree programs could be systematically coded and maintained. This resulted in a structured electronic version of an authority file which:

- provided a machine-readable set of degree requirements establishing the basis for computerized evaluation against individual coursework, and
- provided an external data structure which could then be modified or maintained by an administrator trained in the usage and meaning of the electronic catalog language.

By 1983 an AACRAO survey noted that 132 colleges and universities had some form of degree audit or advising systems in place or under development. In 1984, Brigham Young sponsored a conference on Degree Audit systems (Peterson, 1984) which was attended by Cuyahoga representatives. Degree Audit systems from a number of schools were presented and reviewed in terms of functionality, cost/benefits, ease-of-use, and other factors.

Each system was similar, especially in the following respects:

- Nearly all were mainframe based in keeping with the expected volume and size of the application, batch requirements, security, and concurrent access needs.

- Most systems began their "lives" as batch systems, producing audits en masse. As terminals and networks became more pervasive and costs for computer cycles spiraled down, developers began retro-fitting or rewriting their applications to support on-line activities.

- Most systems had long development lifecycles and underwent significant tuning and enhancements. Acceptance and "burn-in" were often painstaking, and tended to lengthen the development lifecycle.

Not surprisingly, methods and designs were vastly different from system to system. The following contrasts are evident from one of these degree audit conferences:

- the scope of each system was quite different. The core degree audit function and some form of individualized report were common (although report formats differed widely), but additional functionality in "degree-shopping", aggregate or statistical reports and information, on-line capabilities, and "spin-off" functions (e.g. prerequisite handling) were widely different.

- Cost to develop each system varied widely. Some schools stated very low costs considering the rigorous algorithms and large scope of the application. One (honest) developer stated that the cost was much higher than anyone anticipated.

Today, the use of degree audit or computer assisted advising is widespread in higher education. An internal study (SCT, 1990) indicates three quarters of the leading educational software vendors advertise a degree audit function as part of their student system packages. Systems such as PACE, and most notably the Miami University System called DARS (c.f. Southard, 1989) are used at many other schools. The DARS system developed in PL/I and ported to ANSI COBOL is particularly attractive because of its self-contained or "black-box" nature. DARS operates exclusively in core or working storage, encouraging the local developers to build their own drivers and reporting framework around the DARS degree audit engine.

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Design Methodology

AGIS is normally configured as a cooperative processing application that draws on a host computer or database server student information system (in our case ISIS) to download current and historical student transcript information to a workstation based degree audit application. This is accomplished in realtime through a background communications link that is transparent to the enduser.

The student records are then compared against a selection of program requirements keyed to the program name and catalog year. The source of these requirements is typically drawn from a database (Btrieve) resident on a local area network server (Ethernet running Novell Netware) which holds the full compliment of degree programs from 1980 until present. The electronic catalog is more fully discussed in the next section.

The following table (Table 1.0) briefly illustrates our three-tiered approach to AGIS.

Table 1.0

Mainframe/Host	LAN Server	Workstation
Authority Degree database including Structured, non-structured, conversion table, and attribute tables.	Mirror Degree database & tables	(Mirror Degree database & tables)
Student Records	User Selected Student Records)	(User Selected Student Records)
	Application (EXE), Utilities, DBMS, and Communication drivers	(Applications)
	System Parameters	User Parameter files

The authority degree files co taining the Degree Coding Language (DECOL) statements of program requirements, and other parameterizations are stored on a Bull-Honeywell mainframe. However, the user accesses an operational degree database which mirrors the mainframe files. Utilities provide the means to download all or a portion of the mainframe file to the LAN server, or in some instances to a workstation that is only connected to the mainframe.

The actual AGIS application is launched from the network server (or stand-alone). The user will normally retrieve or download an individual student's record from the host, but they may also retrieve batches of students. In addition, it is possible to store student records on the LAN or PC for later processing.

In the case of a counseling office, an individual counselor will know their day's appointment schedule through a related system called the Counseling Reservation System. They may choose to retrieve all students expected for appointments and store these locally for later perusal and auditing.

Although we do have some (three out of 66) users without LAN capabilities, the three tiered Mainframe-LAN-Workstation connection is much preferred. With a large installed user base (> 50) a reasonable amount of control and management of software releases, security, and the integrity of the degree files is only possible with the LAN server capabilities in place.

Development Methodology

At Cuyahoga, the concept of an automated degree audit was explored in detail as early as 1978. The conversion to a new on-line system placed AGIS on the back burner until 1984, when a detailed analysis was presetned on the need for AGIS at the College. At this same time, Cuyahoga developed a comprehensive technology strategy for networking via a LAN/WAN topology built around the microcomputer as an intelligent workstation.

By 1986, a new set of workstation-based or cooperative applications was envisioned as a path to mainframe independence and distributed information systems. As the Cuyahoga network expanded and matured, serious work on AGIS functional specifications were completed in early 1988.

Most critically, the decision to purchase and customize an existing audit system was decided against in favor of a "ground zero" development effort. This was made in light of the strategic network decisions, and the very good fit between the AGIS specifications and a workstation-based application. In addition, we estimated a major customization effort would be necessary to bring an off the shelf package to production in our environment. AGIS was seen as a research and development effort acting as the "testbed" for future cooperative or client-server based applications which would operate in the distributed network.

We subdivided the development effort into two major phases:

- Phase I - Within six months (beginning January, 1989), provide an interactive function for both advisors and graduation personnel to produce degree audits on-line.
- Phase II - By January 1991, deliver a batch component for "distance advising"; i.e. mass degree audit processing and mailings.

Work began in early 1989 on the coding of the system. We devised a development team consisting of computer center analysts and a specific group of users from the counseling and records area. We coined the phrase "User/Tester" to describe their role as the individuals who would mold and shape AGIS into its final form. This prototyping or iterative venture began with the creation and review of an expectations document by the development team. The following excerpt indicates some of these expectations:

> "..Your role in the development of this tool is twofold:
>
> > Test the current version of the application for reliability, accuracy, and robustness (lack of errors).
> >
> > Review the current version in terms of functionality and suitability; i.e. does it perform its function in an efficient and understandable way. Does it fulfill its purpose.
>
> Our intent in planning the development and implementation of [AGIS] is to deliver an initial release of the software as soon as possible, so that we may receive Test and Review feedback early in the development cycle. We call this an iterative development lifecycle which has the following advantages in terms of methodology:
>
> o Unburdens the designers in that they do not have to "think of everything" in the initial design. This includes both the technical and functional (user) parts of the design plan.
>
> o Defines an interactive methodology which give a positive feedback loop whereby short-interval testing and review feedback can be incorporated into the next Iteration of the software or application and the subsequent testing and review continues."

Later on we caution the User/Testers:

> "You should expect two things from the initial release of the Degree Audit software; quite simply:
>
> > It will have limited functionality
> >
> > It may be unstable in terms of reliability"

In retrospect, the review and acceptance of the expectations document was a vital exercise. As a group, we agreed on a clearly stated starting point where user involvement was an integral part of the development lifecycle. The development team worked through six monthly iterations, before the interactive system began to crystallize. We noted the following advantages to this method:

- A continuing and strong sense of movement and urgency to the project.
- Keeping the technical development in synchronization with the needs of the users.

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- Almost immediate buy-in and enthusiasm from the small group of six User/Testers; they quickly realized the difference between Steering or Task Force committee participation and hands-on involvement in the project.

- Reaching deadlines and due dates became second nature. The monthly iterative cycle contained a series of milestones culminating in a month-end meeting of the group. This cyclic repetition became ingrained.

Additionally, the development group became close-knit. Very candid discussions took place regarding troublesome policies and operating procedures that impacted the counseling and the admissions/records organizations. These "debates" were invaluable to the on-going process, but they could quickly become diversions to the task at hand. We can also list the following negatives, which are mostly by-products of this iterative team development methodology:

- Maintaining and supporting the early release software was labor intensive. Normally, such an immature system would not be available for user prodding and poking.

- Identifying the final solution. We converged towards the final solution, but it was a matter of opinion when and in what form this would actually take place.

- Predicting total technical resources was inherently difficult. Our blueprint was a set of functional specifications and an overall system design. Critical paths, sizing considerations, and system integration concerns were difficult to anticipate and were often a moving target.

Progress on the audit function and reporting formats continued through each stage of the iterative cycle. The process also aided in developing a clear picture of the desirable style for the "electronic catalog" of degree requirements against which the student record would be audited to produce the AGIS reports. The catalog component of the system was also refined several times through the iterative development cycle.

The Electronic Catalog

Cuyahoga Community College offers six major degrees:

Associate of Arts
Associate of Science
Associate of Applied Business (25 majors)
Associate of Applied Science (40 majors)
Associate of Labor Studies
Associate of Technical Studies

A variety of non-degree programs is also available. Approximately 90 separate programs make up the list of curriculum offerings for students.

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Curriculum changes are common. In some cases, changes affect course content while the list of required courses remains the same. Frequently, course numbers and/or titles are revised along with content. Occasionally, major revisions of degree requirements take place. The result is that an extensive set of curriculum documents and catalogs is needed by the College's advising personnel and graduation clerks. Many of the College's students pursue studies on a part-time basis, and interruptions in their attendance are common. Four or five years often pass prior to graduation, with attendant revisions in program requirements. Students themselves rarely have the complete sets of catalogs and course revisions to accurately follow their intended program through to completion. Under these conditions, the advantages of a concise electronic file of program requirements are obvious.

The curriculum approval process at CCC is managed through a centralized office that works with the governance committee on Curriculum, Degree Requirements, and Academic Calendar. After approval by the College's Board of Trustees, program requirements are disseminated through the Curriculum Office, which is thus the central authority site for official statements of program requirements. These are published in the College catalog; changes that take place between the publication of catalogs are announced through notices in quarterly class schedule booklets and through academic advisors.

Prior to the development of the electronic catalog files for AGIS, advisors and graduation clerks worked with the printed catalogs, supplemented by copies of memos or course change information supplied through the Curriculum Office. Especially when working with students whose requirements were governed by a catalog more than three or four years old, this process was time-consuming and had a significant potential for errors due to course numbering changes. Since access to complete information was mainly through the College's counselors, the system did not foster independent action for students. Meanwhile, professional staff spent significant time on the mundane tasks of looking up course changes and reviewing revised requirements with students, rather than assisting students with issues more likely to call for professional expertise, such as career exploration, transfer planning, or personal adjustment.

In establishing the electronic catalogs for AGIS, the College was guided by the specifications assembled by a task force of representatives from counseling, admissions & records, faculty, and the computer center. These included:

- statement of program requirements in simple English as well as in coded form,

- specification of requirements in a wide variety of forms (e.g., a specific course or set of courses, one or more courses chosen from a set, a specified number of credit hours from a set),

- capability for the use of "building blocks" of requirements that could be linked into degrees,

- use of non-course data, such as grade-point average in a course or set, total credits completed in residence at the College, test scores, etc.,

- accommodation for substitution of one course for another and for waiver of a course,

- the capability to allow a course to apply to more than one requirement, or to limit use to only one requirement,

- the use of "shorthand notation" to express ranges of course numbers or course levels, rather than listing every possible course number.

In preparing the electronic catalog, the computer center staff developed a degree coding language (DECOL) that would be used to describe a degree or non-degree program. These DECOL requirement statements are compared to the student's record by the microcomputer; various output reports can then display requirements still to be completed, or show the detailed list of requirements and how the data elements were applied to those requirements.

The electronic catalogs are referred to as the authority database. To develop this database, a file was prepared for each degree or non-degree program. Since the College's on-line student record system was implemented during the 1979-80 academic year, it was decided to build the authority database with every program offered from the 1980 academic year forward. The source of official information on each program was the Curriculum Office.

Each program file consists of two sections: 1) an English-language listing of requirements, including course numbers and titles and certain narrative statements; and 2) a series of DECOL statements which express the requirements in structured, machine-readable form. Courses are listed by numbers currently available; a component of the AGIS program matches discontinued numbers from a student record to the currently available equivalent. The English narrative requirements point out such number changes, e.g., "MATH 116 - Technical Mathematics (formerly MATH 108)." The initial creation of the dozens of files for all catalog years back to 1980 occurred during 1989, and involved significant contributions from clerical staff (text entry), counselors (proofreading, validating, and correcting), and the Curriculum Office (resolving questions concerning College-wide standardization of course revisions).

As mentioned earlier, AGIS is a microcomputer-based system. For security, accuracy, and consistency, the authority database of program requirements is stored on the College's mainframe computer. Programs can be downloaded for use in academic advising or graduation checks. Most AGIS users have access to a Local Area Network (LAN) version of the system, so management of the electronic catalogs for the LANs can be handled by one person. The College has identified one of the counselors to act as the database manager.

Clerical staff assist with text editing on the degree files and with uploading of new and revised curriculum to the mainframe. The counselor downloads all updated programs for LAN users, and notifies them concerning changes via electronic mail. Non-LAN users are notified by memo in the campus mail system, and each can then download any new programs, as needed. Questions or problems regarding curriculum and requirements are communicated to the counselor for review with technical staff, the Curriculum Office, or other personnel, as appropriate.

As AGIS moved through the development cycle, the DECOL language has been improved. DECOL I was limited in expression of courses as either individual course numbers or as certain wildcards which indicated that any course in a given department could be applied. DECOL II introduced shorthand symbols which allowed for numeric ranges of courses to be expressed more simply; further, the courses within the range could be linked by "AND" or by "OR" conditions through the use of simple symbols. The development of attribute tables allowed varied groups of courses in different departments to be represented by a single coded expression in the DECOL requirement statement, e.g., a single symbol for laboratory science courses directs the matching logic to a table listing all possible departments and course numbers which fulfill this requirement. Thus, the simple English statement, "complete any college-level laboratory science course" is represented in DECOL by a single expression, rather than by a lengthy list of possible departments and courses. Some examples of the non-structured narrative statements and the structured DECOL follow:

Minimum competence in Communications by completion of the following:

ENG 101 - College Composition
ENG 102 - College Composition
ENG 103 - College Composition

[ENG 101->103]

Minimum competence in natural sciences by completion of any college-level laboratory science course

[$LAB *]

Completion of ONE of the following courses:

ART 101 - Art Appreciation
MUS 103 - Survey and Appreciation of Music
THEA 101 - Theatre Appreciation
Any 200- level English course

[ART 101 or MUS 103 or THEA 101 or ENG 2??]

Completion of a minimum of 6 credit hours selected from any combination of the following courses:

ECON 161 - Principles of Economics
ECON 162 - Principles of Economics
Any Political Science course(s)
Any 200-level Sociology course(s)

[@ 6 ch @ (ECON 161-162 or 2xPOL * or 2xSOC 2??)]

Lists of such statements can be combined to describe all the elements of a degree program. Standard "building blocks" of common degree requirements can also be utilized and combined to create degree programs. Future planning calls for a method to generate English-language text statements directly from DECOL statements. Such an innovation will eliminate the current possibility that a single program file could have a disparity between the English and DECOL description of the program requirements.

The development of the electronic catalog/authority database brought out several major organizational issues at the College. It was found that advisors or graduation clerks at different campus locations sometimes had different approaches to determining requirements where there had been significant curriculum change over the years. The need for precise definition of degree requirements (clear enough for a "dumb machine" to understand) brought out that certain programs contained requirements which were open to multiple interpretations; again, different department heads had developed different practices at different times or campus locations.

The curriculum review undertaken in preparing the authority database helped to identify the issues so that academic authorities could achieve uniform resolution for all campuses. Built into the centralized database, the best thinking of College-wide authorities becomes accessible to all users. Thus, AGIS offered a management tool to help achieve consistency throughout the College. Further, the Curriculum Office now reviews program requirements more closely to assure precision and clarity of meaning to avoid future possibilities of differing interpretations.

Curriculum change had been gradual, but AGIS allowed for ready comparisons of a specific program as it existed in 1980 and as it looks today. This brought greater awareness of the extent to which some programs had changed and raised a new issue for the College: the question of how long a student might be entitled to pursue the original curriculum, and at what point the College might require a student to fulfill more current graduation requirements. As a fairly young institution, CCC had not set out rules to advise students on which catalog they would need to follow. Policy/procedure development for "catalog in force" is now underway.

Summary

In summary, the electronic catalog/authority database is at the heart of the College's directions for academic advising and automated records processing. The process of implementing this system has also provided opportunities for organizational improvements, consistency of standards, and the creation of new management tools for the College's curriculum process.

Counselors currently use AGIS reports in academic advising, and the records offices are utilizing the system to notify potential graduates of remaining requirements. Individualized AGIS reports, in a letter format, were sent to all students who petitioned to graduate as of the end of Winter Quarter 1991; these mailings were timed to arrive prior to the beginning of the registration period, so potential graduates could use the AGIS report to select their final courses. Pilot mailings of batch advising reports are planned for mid-1991, when students in selected majors will be mailed an AGIS report as a quarterly update on their progress in the program.

Degree Audit capability is becoming an increasingly basic student service, as well as a system platform for curriculum analysis, scheduling and load modeling, widespread faculty advising, and early warning or alert systems of individual student progress. Direct student access to their degree audit or advising records is problematic, but manageable (c.f. Lonabocker, 1989). The task of creating a structured set of program requirements and building algorithms to evaluate these requirements is, likewise, being refined and standardized (c.f. Darling, 1987). The individual student's expectations will soon change to include degree audit and automated advising support as a requisite part of an institution's basic resources and services.

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CUSTOMIZED TOOLS

CAAD System (Computer Aided Application Development)

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Customized tools is a software system (CAAD) that Iowa State University uses to aid the programming staff in the development of application systems. The CAAD System is built around several ADP Center databases at ISU. These databases provide input for the CAAD generator programs that produce the source statements for application programs. This process eliminates much of the tedious coding or code copying, speeds up the development process, reduces costs and has positive effects on application development staff.

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CUSTOMIZED TOOLS

CAAD System (Computer Aided Application Development)

Overview

The CAAD System is a set of productivity enhancement tools used by our application development and maintenance staff. The system consists of many separate units that work together effectively to help applications programmers get their work done. Each unit in the system is designed to improve the programmer's productivity by eliminating large portions of tedious program coding, producing better documentation, and facilitating the understanding and maintenance of the code.

Development

The model used in developing these processes has its basis in long term procedures and programming standards used in the ADP Center. The importance of everyone on the staff using the same organization and style in their processes is a principal concept of the tools.

While developing approaches to using the computer as a tool to aid programmers, it became apparent that much of the information needed to accomplish this was already available in other in-house developed systems. This project was also highly influenced by a team of students doing research on ways to improve analyst to programmer communications for coding programs. In addition to the objective of generating code with computer systems, we felt that improved documentation could also have a major impact on programmer/analyst productivity. Since documentation has a history of generally not getting done, the development of the tools was highly oriented toward having the documentation be part of the application development process. The system is thus designed such that the basic information about an application will document much of the system prior to development and will be used as input to the tools that generate the program source code.

During the early stages of development, we continually studied software tools oriented toward aiding system development that were from other sources. The tools available at that time appeared primitive for our use, required a lot of machine resources, were high in cost, and did not follow the ADP Center's internally developed standards.

Using the ideas from our previous experiences and from observation of the vendor tools available, we began to develop tools that could reduce many of the tedious tasks involved in application development. As we worked with the tools, we continually looked for input that could make the generated code more complete. We found that many datasets in the Center contained data that could be helpful in making generated code more complete.

The System

The System consists of seven major datasets and approximately 15 programs. Appendix A is a graphic of the general system flow. The main dataset, the File Master, in the system contains the primary information concerning files used by the tools. This dataset has a 7-character file ID key and contains the record size, record key information, file organization, and record description name. Other datasets used by the tools include a User Master File, System Documentation Master File, Program Title Master File, Analyst and Programmer Name Master File, Map Parameter File, and Data Dictionary File.

The input to the generator contains the ID for the program, system, file, user, and map. The ID for the analyst is available on the System Master. The ID for the author (programmer) is available on the program title master.

The generator program, a COBOL program, creates COBOL source statements that follow the standards developed by the ISU ADP Center programming staff. The code is very complete for the definition of files and the accessing of files. After the generating process, the programmer adds the source statements necessary to do the desired logical functions.

Because ideas and input were gathered from the entire professional staff, the acceptance level in using the tools is very high.

The System has been upgraded to support DB2 programming and now creates the desired source code instructions for DB2. This serves as a great aid in converting applications to DB2 because the application development tools take care of most of the basic routines. This allows programmers to write new programs much faster than when they have to learn all of the DB2 programming rules and use specifications.

Benefits and Costs

This project has proven to be very rewarding because it saves a lot of a programmer time and is heartily accepted by all programmers. Since programmers can improve their application turn around time, the users also become more satisfied. Another advantage is that the code meets standards for the ISU ADP Center. These standards make the code easy to follow because every COBOL program has the same organization, documentation content, and style.

The costs of the tools have been much lower than the costs of purchasing such software. The initial programming was done with part-time student employees; therefore, the cost has been kept lower than with full-time staff. These tools also give us a good beginning for any move to current or future CASE tools that may improve upon the CAAD System.

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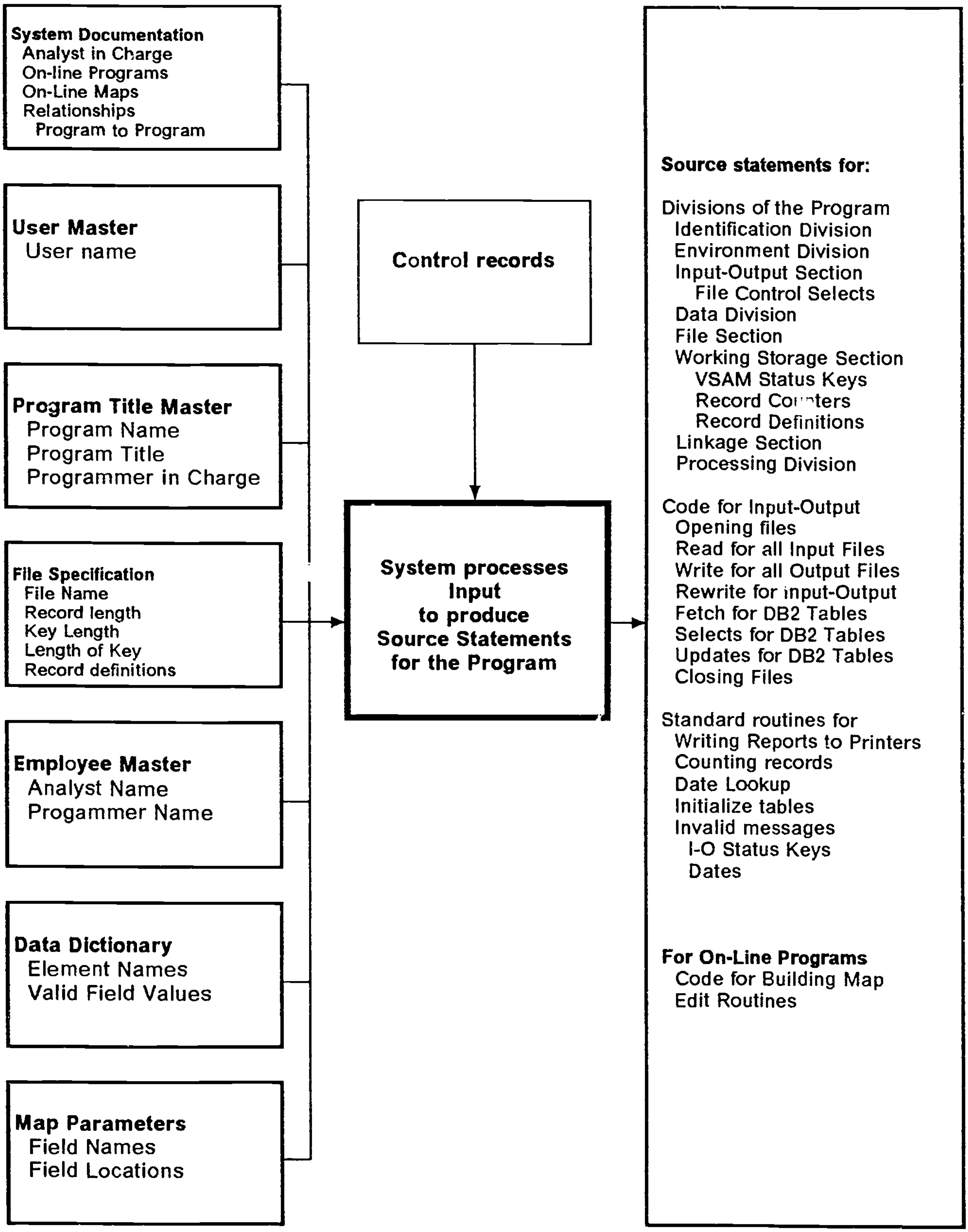
Conclusion

Most Data Centers have datasets similar to ISU's available to support the types of tools we have developed and use. We feel that much of the success we have in satisfying user needs is due to the support tools we have implemented. We are interested in sharing with others concerning their activities in this area and their future plans. Many of the available new CASE tools are large and offer good possibilities. Their present costs, however, may be high for many small-to-medium Data Centers; therefore, we may need to continue finding our own ways to help our staff members improve their productivity. Using automation to help us do our work is increasingly important to the future of administrative information systems technology.

COBOL Generator Flowchart



A COMMON INTERFACE TO MULTIPLE APPLICATIONS

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The University of Illinois runs a library circulation system and an on-line catalog which are two separate and unlike applications. We are about to install a bibliographic search engine, BRS, which has yet another command language. In addition, the libraries in Illinois for which we provide library services wish to access many commercial services. We need to provide a common interface in order to make access to all of these applications have the same "look-and-feel" and to provide assistance to naive users, similar to that which would be provided by a proficient reference librarian. Several different user groups have written various interfaces, both PC and minicomputer based. We intend to build on this work; provide the same functions from the mainframe for non-PC access; and integrate access to new services as required. We have developed a strategy to distribute the interface to various platforms, including MVS, DOS, OS/2, and AIX.

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Background

2500 libraries in Illinois participate in the Illinois Library and Information Network (ILLINET) through 18 regional library systems, administered by the Illinois State Library. The computer system which supports these libraries is called ILLINET Online. It provides a union catalog for the 800 ILLINET/OCLC libraries in the state, circulation facilities for 38 academic libraries, and interlibrary access for all libraries in the state. ILLINET Online is directed by the Illinois Library Computer Systems Organization (ILCSO), which has 3 levels of membership:

A. Direct participants: institutions that maintain a current circulation database and agree to lend their materials to other ILCSO members. Patrons of these institutions may borrow materials from other ILCSO members.

B. Reciprocal participants: institutions that use an automated circulation system other than ILLINET Online and develop direct links between their system and ILLINET Online, allowing reciprocal borrowing.

C. Indirect participants: all other ILLINET member libraries. Indirect particip:nts may borrow materials for their patrons from direct particpants.

The computer facilities and telecommunications network which support ILLINET Online are operated by the University of Illinois, through the University Office of Administrative Information Systems and Services (AISS). These consist of an IBM 3090-200J with about 1400 hard-wired terminals and 100 dial connections.

The funding for ILLINET Online comes from three sources: the Illinois Board of Higher Education (72%); the Illinois State Library (10%), and the ILCSO member libraries (18%). The annual budget for FY 1991 is $4,500,000.

Components

ILLINET Online is made up of several components. The Library Computer System (LCS) is the circulation component. LCS was originally developed by IBM for the Ohio State University Libraries and was the first component of

ILLINET Online, beginning state-wide operation in July 1980. LCS contains abbreviated bibliographic records which may be retrieved by call number, author and title. It supports a full range of circulation transactions: charge, discharge, save, and renew. It is used by direct participants to circulate material to their own patrons as well as to off-campus borrowers. The LCS database now contains records representing 10.5 million titles and 18.3 million volumes.

A second component of ILLINET Online is the Full Bibliographic Record (FBR) system. This is the online catalog, and is based on software developed by the Western Library Network (WLN) running under IBM's Customer Information Control System (CICS). FBR serves as a shared union catalog for the 800 libraries in Illinois that participate in the ILLINET/OCLC project. In addition to serving as a statewide union catalog, FBR doubles as a local public access catalog for the 38 direct participants. FBR records are complete cataloging records and may be retrieved by subject, title keyword, author, and other types of bibliographic information. The FBR database now contains 4.7 million bibliographic records and 7 million author/subject records.

Two other services are available. The Illinois Bibliographic Information System (IBIS) is based on a data base searching engine written by BRS Software Products. It can access a number of different commercially produced data bases. The two campuses of the University of Illinois are providing Current Contents, Medline, and eight Wilson data bases to their patrons. Plans are under way to extend access to some of these data bases to the rest of ILLINET Online in the near future. IBIS can search any text data base; most of the commercially available data bases are citations to journal articles, which are in great demand by the libraries.

The Colorado Alliance of Research Libraries (CARL) provides another search engine which runs against bibliographic data, text files, and other kinds of data. ILCSO has contracted with CARL for a service called UnCover, which provides an index to journal articles. CARL has included the ILLINET Online holdings information in their data base, so that when an article is located, Uncover will display libraries in Illinois which have that journal.

Network

The ILLINET Online institutions are served by a state-wide telecommunications network, using IBM's Systems Network Architechture (SNA) The network connects about 1400 terminals throughout the state

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with the computer facilities at the Chicago campus of the University of Illinois. Terminals are primarily ASCII terminals or PCs emulating ASCII terminals. Terminals at a given institution are multiplexed onto a single phone line by the IBM 3708 Network Conversion Unit. The terminals in the southern half of the state are brought back to a communications center in Urbana and then concentrated onto a high-speed link to Chicago. Terminals in the northern half of the state are connected directly to the Chicago location.

Differences in Applications

The ILLINET Online applications vary widely both in structure and in use. FBR has complete bibliographic data for items cataloged since 1974, but very little holdings information. LCS has complete holdings information for all items, down to the piece level, but has abbreviated bibliographic infomation. Neither FBR nor LCS has information about articles *within* the serials listed in the data bases. This type of article information is provided by IBIS and CARL, but IBIS has no holding information to show where the article might be found. CARL has holdings information for some, but not all, ILCSO libraries, but does not have call numbers.

The command languages also vary. FBR and LCS are command driven, although the command languages are quite different. IBIS and CARL are both menu driven, but there is little similarity in their appearances.

FBR, LCS, and IBIS are all IBM mainframe applications, while CARL runs on a Tandem mainframe. FBR and IBIS run under IBM's CICS telecommunications monitor; LCS is a stand alone application using TCAM and VTAM for terminal access. FBR is written in PL/I and assembler; LCS and IBIS are written in assembler. FBR, LCS, and IBIS are all run at the University of Illinois; CARL is located in Denver, Colorado, and a VTAM network connection is provided from it to the Illinois network.

Ad hoc solutions

With such diversity, it was difficult for the average user of library services to know which service he wanted, how to access it, and what to do with the information after he got it. To get around these problems, ad hoc solutions began springing up in the user community. A U. of I. linguistics professor produced a PC-based front end program which attempted to integrate access to LCS and FBR. It also provided assistance in formulating searches and navigating through the command language and it translated some of

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the coded information in the displays to a more readable form. It did this by emulating a standard library terminal and issuing existing LCS and FBR commands, as needed, and then combining the output into a more homogeneous display. This front end was widely used on the Urbana campus and was later distributed to some other ILCSO libraries.

When CARL and IBIS became available, a new version of this PC program was produced, taking advantage of software and hardware advancements to provide a library workstation which accessed the four applications mentioned above, plus other dialup services and some local applications.

The Computing Services Office (CSO), the academic computing center at the Urbana campus of the University of Illinois, provided a terminal server to allow access to ILLINET Online from terminals connected to the academic campus network. Again, it attempted to aid the user in constructing LCS and FBR commands, although the appearance was different from the PC program used in the libraries.

Although these user interfaces were developed independently of the mainframe applications, it was soon apparent that they were not truly independent. Since the interfaces relied on using existing commands, and on extracting data from fixed locations on screens, any change in the mainframe application had the potential to disrupt the operation of the interface programs. In fact, several mainframe changes had to be backed out when it was discovered that the PC interface would no longer work with those changes. The developers of these ad hoc solutions did not anticipate our widening range of services, nor were they able to provide adequate support for their products. It was clear that some sort of central coordination was required. In addition, there were many terminals in the network which could not run the PC interface and were therefore unable to get the benefits of a user-friendly interface.

Design of new interface

For these reasons, AISS decided, in October of 1989, to begin the design of a new, mainframe based, interface which could be used by all library patrons, regardless of whether they had a PC or not. This new interface, called MILO (Mainframe Interface to Libraries Online) would be written in a fourth generation language; it would take advantage of menus, help facilities, and pop-up windows as appropriate. Initially, it would provide an interface to LCS and FBR; in the future, it would be extended to IBIS, CARL, and other network services. MILO was designed to be used on the IBM 3270 display terminal, or equivalent, and its appearance was

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specified by librarians, with aid from AISS. To accomplish this, the ILCSO Operations Committee created an Interface Subcommittee, whose charge was to develop a prototype for MILO. The prototype, developed using DEMO II, prescribed the screen layouts, the sequence of menus and the format in which the data was to be displayed. In particular, the Interface Subcommittee specified the points at which the help function could be invoked and the wording of the help screens that would occur, based on their experience with common user problems.

This prototype defined a number of facilities which were extensions of existing operations. For instance, FBR could list books by Charles Dickens; MILO could give you the books by Charles Dickens published between 1850 and 1855. FBR could list all the books on aardvarks; MILO could select only those books on aardvarks written in German. MILO could also display information based on the form of the item. Where FBR could list all copies of Beethoven's Fifth Symphony, MILO could list only the scores, or only the sound recordings, as desired. The addition of filtering and sorting to MILO's processing allowed access to the data in ways which were not possible without MILO. The prototype also specified a seamless paging back and forth in lists, without the end user being aware of the specific commands being issued behind the scenes to produce the display.

While this prototyping effort was in progress, AISS, with the assistance of IBM, proceeded with the detailed design of how MILO would function. As the old applications all performed their respective tasks well and the effort involved to recode them was prohibitive, we decided that MILO would use existing commands to communicate with all applications. As the design proceeded, it became apparent that a few additional data formats were needed from FBR and therefore code was added to FBR to provide them. These data formats supplied blocks of data for MILO to process, rather than screen images to be displayed. Since this interaction was in the nature of a peer-to-peer relationship, the design called for something other than terminal emulation by MILO. IBM's Advanced Program-to-Program Communications (APPC) was chosen for communication between the two CICS regions (MILO and FBR) and between MILO and LCS. The modifications to FBR and LCS to add APPC support were relatively minor, localized changes.

Several benefits resulted from this design. Coding of the various parts of the system could proceed in parallel, thereby shortening the development cycle considerably. In the future we would be free to modify the applications as necessary, because MILO could shield the users from these

changes. The change from the ASCII terminal standard to the 3270 made available other network services that were written for 3270 terminals.

The fourth generation language chosen for writing MILO was NATURAL from Software AG. As FBR uses Software AG's ADABAS for its database management system, NATURAL was already available as a tool. We felt that using NATURAL would provide substantial productivity enhancements in the development of MILO over using PL/I or assembler language.

Although one major benefit of this approach was the minimal changes necessary to the older applications, we actually have a long-range plan for major changes to LCS. In the future, we intend to move the bibliographic information out of LCS into FBR. Consequently, all searching for items will be done using FBR search commands rather than LCS search commands. By having MILO in place before doing this restructuring, it can take place entirely behind the scenes. The average user will be totally unaware that the familiar search results screens are being created with a different set of search commands.

Implementation

We divided the implementation effort into several areas. The coding on MILO began first, programming the user screens as defined by the prototype. Using a stub to retrieve a few sample records of each format, work was able to proceed although MILO could not yet communicate with any of the other applications. At the same time, we contracted with a consulting firm to provide the basic APPC routines to communicate from one CICS to another CICS and also to a stand-alone VTAM application. This APPC code was then incorporated into LCS using a simple driver program from CICS. The remaining link was then put in place so that the MILO code could call, via APPC, on LCS for its test data.

At the present time, the MILO coding is about 2/3 complete, the LCS modifications are complete, and the FBR modifications are in progress. We have made a test version of MILO available to the Interface subcommittee so that we can get feedback as the development proceeds.

While the mainframe interface was being developed, a project was underway to prepare a PC interface program which would use MILO to access LCS/FBR, and would also provide sophisticated searching assistance in accessing IBIS and CARL. This PC program also provided a framework for local library information services and local data bases of interest to a specific clientele. It was developed at the Urbana library, and will be

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packaged and distributed by AISS to the ILCSO libraries and to individual faculty and students.

Distributed Processing

The MILO design, although running on a single mainframe in the first implementation, is capable of being distributed to any platform which supports APPC. This would allow MILO to be ported to other mainframes (or to PCs) at some time in the future. We have the option of running multiple copies of MILO, on different CPUs, at different locations, if desired for better performance. We could also run multiple copies of any of the search engines, if that also becomes desirable as the system grows.

Much work has been done on the PC interface used by the Urbana library, particularly in the area of local services and a user-assisted IBIS dialogue. To bridge the gap until MILO is fully functional, this PC program will be distributed to the rest of the ILCSO libraries. As MILO is phased in, the ILLINET Online assist features of the PC program can be reduced and the local functions enhanced. In a later phase, this PC program can be changed from a terminal emulator to a peer communicating directly with the other applications: a PC version of MILO. This version would be able to take advantage of advances in PC presentation software to produce results that would be unobtainable from mainframe-based MILO alone.

Conclusion

We have concluded that you can blend several older systems into a seamless, apparently new, application with much less effort than it would take to replace the older applications. This approach makes sense if the underlying applications are sound. In our case, LCS and FBR were very flexible and efficient search engines. What made them appear dated was their old fashioned commands and displays. We are realizing the productivity improvements that go with a fourth generation language, without having to rewrite the entire applications. We think this is a good start to a major refurbishing of one of the applications, as MILO will preserve the appearance of that application while the structure changes radically.

We felt that it was important to get control over the other interfaces, either by providing an improved version or by providing a new facility that made them obsolete. This gave us a lot more flexibility to make changes in the system without the fear that some unknown interface would stop working. The easiest way to provide this new interface was on

a mainframe, but we wanted to be able to take advantage of distributed processing at some later date. We intentionally designed MILO to that parts of it could be distributed to workstations in the future.

Finally, we were fortunate to have a group of resourceful librarians to develop and test partial solutions to the interface problem, so that they were able to give us some good advice when the time came to develop MILO. We think the result will be a state of the art system for our user community: the libraries of the State of Illinois.

CAUSE90
MIAMI BEACH
NOVEMBER 27-30, 1990

TRACK VIII

MANAGING DISTRIBUTED COMPUTING SERVICES

Coordinator: Alice Hunt, University of California / Santa Cruz

User managers are demanding direct access to institutional databases to support their decision making and planning activities. The resulting distributed computing brings a unique set of challenges and opportunities, which are the subjects of the papers in this track.

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Rendering an Academic Technology Vision

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ABSTRACT

Within a decentralized, academic environment, a central computing organization faces great challenges. It is expected to play the role of optional service provider, educator, facilitator, collaborator, persuader. Computing services are distributed unequally among Harvard's eleven Schools, and the central computing department plays a vital role in infrastructure planning.

This presentation will focus on how Harvard's central computing organization tries to clarify and identify an academic information technology vision for faculty. Three studies of Harvard's technology uses and needs conducted during the past two years lay the foundation for the vision. Recommendations and plans for providing computing support services based on these studies will be described. Existing technology-based academic projects at Harvard will be analyzed in order to identify commonalities in the development process, paths for collaboration, and areas where support is required. Collaborative efforts between central computing and the Schools serve to expose, inform, train, and support faculty who use technology for teaching and research.

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Introduction

Taking the steps to render an information technology vision for an academic institution can be a straightforward process. In a decentralized institution, however, the task of getting people to collaborate and agree on a vision which will reflect the best alternatives for the faculty and students is extemely difficult. During the past two years the Technology Planning and Support Group (TPSG), a group of people associated with the Office for Information Technology, has been formulating a vision for Harvard University regarding computing services to support research and instruction. This vision reflects the findings of several studies and data collected from the computer using community.

This paper will describe the results of four studies, the vision the studies rendered, and one of the mechanisms for transmitting this vision to the Harvard community. (In this paper, *render* should be understood in several senses: to reflect, report, and deliver, to impart, and not least, to cause to be or become, as in architectural drawings where *rendering* means to flesh out a concept and give it substance.)

I. The Scenario

Founded in 1636, Harvard is the oldest institution of higher learning in the United States. Its decentralized, academic environment consists of 10 graduate and professional schools and an undergraduate Faculty, and covers a large geographic area (including Cambridge, Boston, and even some outlying communities). A federalist attitude of local control and autonomous management and decision-making persists. In 1990 Harvard awarded 17,230 undergraduate and graduate degrees. Supporting the student population are 3,600 full-time and part-time faculty members, 4,000 "other" faculty, and 8,500 non-teaching staff members.

The Office for Information Technology (OIT), constituted in 1970 as part of central administration, consists of approximately 200 employees engaged in the provision of computing, communication, and network services. A recently completed, campus-wide fiber backbone connects the entire campus in a network of interlinked, local- and wide-area networks connecting mainframe, microcomputer, and minicomputer users.

Harvard's planning and budgeting takes place in each School and Faculty before the central budget is compiled. As with all other aspects of University life, the way budgets are done affects information technology planning and implementation. Individual Faculties and administrative Departments have developed computing systems to meet internal needs and provide users with tools for data management. Services to support these computing environments are generally funded by departmental budgets, research grants, and modest user fees. The central computing services provided by OIT, on the other hand, are supported almost entirely by user fees, with very little core funding to finance general information services. This decentralized method of providing technology to users has left Harvard with a diversity of services provided by a wide range of workgroups and funded inconsistently. Expenditures in this area grew one year at the rate of 8 percent, according to one expense tracking effort.

According to the 1987 Long-Range Plan of the Office for Information Technology (OIT), "no University-wide framework for technology use exists at Harvard, and there are no University-wide standards and controls for implementation." The plan's objectives were, "in addition to identifying OIT's long-range goals and strategies, to begin a process for gaining consensus on these goals and to build awareness throughout Harvard of the University's future information technology needs."

The plan emphasized that information sharing tools are needed and that extensive training is equally important in order to upgrade individual technology skills. OIT's publications and its computer training program were established in their present form along with this plan. The information dissemination and training services are designed to raise consciousness about information technology in higher education and are intended to stimulate discussion and increase customer self-sufficiency in using information technology.

There is no central mandate about technology use and services at Harvard. Thus, OIT can only set some de facto standards through sales of a limited range of hardware and software at the Technology Product Center and by providing training for selected software packages. Individual Schools, Faculties, and workgroups set their own standards and may provide their own computer support structure.

OIT acknowledges the importance of the planning process by designating one of its divisions as the Academic and Planning Services division. Within this division, under the direction of Mary Grace Smith, a group of professionals meet regularly to implement a planning and education process. This Technology Planning and Support Group (TPSG), during the past two and one-half years, has been developing a vision of Harvard's academic computing environment and is trying to build consensus about a plan for delivering computing services more efficiently and cost-effectively to meet customer needs more satisfactorily.

Findings of studies done by TPSG indicate that an ideal computer support structure for Harvard would consist of individual units working together for mutual benefit. Any workable user services plan should recognize the value of discipline-specific support provided by individual workgroups and Schools, with general support provided by a central or coordinated service.

OIT recognizes the challenge of planning in a decentralized environment, since any university-wide plan must be consensus-based and locally implemented. Information sharing and education about the plan is necessary to build consensus, and this makes the process very slow. It is important to avoid deriving a "least common denominator" solution because such a solution would not acknowledge many existing solutions. Hence, four studies, conducted by TPSG, describe the foundation for an information technology infrastructure and the recommendations from these studies can serve as a guide to future technology planning at Harvard.

II. A Vision for Academic Computing Support

Since computing and network facilities exist or are being installed at Harvard, this paper will focus on the computing support or user services aspects of a proposed technology infrastructure. User services for the Harvard community have developed in an ad-hoc fashion; the services are widely distributed, not consistent in quality, and there as variations are due to the needs of the different constituencies.

A booklet produced by the Office for Information Technology summarizes the findings and recommendations from four recent studies of information technology uses and needs at Harvard. What emerges from the four studies and other projects can be consolidated into eight primary observations about Harvard's information technology infrastructure. These eight observations tell the "story" about computing and computing services, while describing themes, and raising questions and issues about a workable university-wide plan for user services.

As stated in the booklet, the studies, initiated for different reasons, were conducted "to determine the kinds of facilities and services required by the University community, and the findings represent a broad array of opinions. The results of these studies are being used to guide planning of future information technology directions of OIT and the University."[1]

For these studies, over 300 teaching and research faculty, administrators, and staff within the Harvard Faculties and Central Administration were surveyed, and in many instances, the findings complement each other.

- The Faculty Research Computing Study focused specifically on the research computing needs of faculty. Findings show that the faculty are generally content with their computing facilities but are dissatisfied with having to raise funds for equipment and with the availability of assistance and advice.
- The High Speed Data Network (HSDN) Needs Assessment Study surveyed a broad cross section of faculty, administrators, and staff concerning their needs for access to information

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[1] *Summary of Findings From Recent Studies of Information Technology Usage at Harvard*, Harvard University, Office for Information Technology, April 1990.

and to electronic information processing facilities. Findings described applications desired over a network, including electronic mail and other utilities, library catalog access, and some basic archiving and back-up services.

- The Longwood Medical Area (LMA) Computing Study considers needs specifically in the Medical Area among Harvard Faculties and affiliated institutions. Findings described the information technology activities and organizational framework of the Medical Schools and Affiliated Hospitals, mostly regarding administrative applications.
- The Academic Computing Support Study examines the level of computer support provided within local organizational units and the issues faced by the service providers. Findings indicate that word processing is the most common application, with data analysis and data base management also prevalent across disciplines. Recommendations define a vision of OIT's and the University's role in providing computing support services.

The eight observations that follow are supported by findings and recommendations in the four studies, as well as data from other projects and surveys by OIT.

Observation 1: Many people at Harvard use computers and networks.

The wealth of information in these studies about how people apply computing and other information technologies documents that computer and network use exists in virtually every discipline among all Faculties and administrative departments. Word processing is by far the most prevalent application, but data analysis and database management are also quite common across disciplines by all categories of users. Other data that supports this observation are:

- The Technology Product Center (Harvard's computer store) sells more than 3,000 microcomputer units per year.
- The Office of Instructional Research and Evaluation, which regularly surveys students on several parameters of college life, shows in its 1988-89 surveys of undergraduates that 63% owned a personal computer and an additional 29% had access to one owned by a roommate — slightly less than one computer for each student.
- The service providers surveyed in the Academic Computing Support Study indicated that 40% of the faculty are served by them.
- An expense tracking project conducted by OIT in 1986 estimated University-wide expenditures at over $50 million an amount that grew at 8% annually. The small sample of support providers who responded to the question about expenditures during the Academic Computing Study last spring estimated that $2 million is presently spent on academic computing services.

Other evidence of computer and network use abounds.

Observation 2: Occasionally computer users need help or services of some kind.

Computer support and user services mean many and varied things to different people. The findings from the four studies supports the assumption that Harvard has many different kinds of computing environments and applications, as well as a diversity in styles of use and levels of technical sophistication among users.

Several different computing access models, which explain how people fulfill their computing requirements, were defined in the Faculty Research Computing Study. They are:

- Individual: The individual arranges for his/her computing needs without recourse to formal service providers.
- Lab or workgroup: A few individuals work together to maintain computing resources, usually without a formal support structure.
- Department: Some departments fund and supply computing resources and support.
- School: Within a School, computing facilities, network, and support staff may be organized.
- Other provider: Services provided by OIT or some other entrepreneurs include access via network or dial-up ports, as well as computing facilities, staff support, and ancillary services, funded by user fees and core appropriations.
- External: Services may be provided outside the University either because of specialized need or for convenience of collaboration with colleagues at other institutions

The range of support services that people say they expect varies according to technical sophistication and diversity of style. Support requirements are based on their needs to:

- identify what they need and find out where to obtain it
- install or configure something
- learn how to use something or how to make it accomplish some desired result
- fix something or otherwise diagnose and resolve a problem
- off-load some work that they do not have the time, skills, and/or staff to do themselves
- perform a function for which they do not have the proper facilities
- keep up with changes in technology that may affect them or present them with new opportunities.

Observation 3: There are many providers of support services at Harvard.

The Academic Computing Support Study identifies many support providers and hypothesizes three broad categories/models of support services.

- Informal: This model usually describes an expert individual who becomes the de facto support provider for a larger workgroup. Within the humanities, the support provider is a faculty member who is a self-motivated technology pioneer. Within the sciences, the provider is a faculty member or graduate student assigned to a research or instructional workgroup or lab.
- Staff: This model, the most common one encountered, is the one which providers identified similar issues and concerns despite varied levels of funding, authority, and endorsement. A staff position was usually created when computing needs crossed research boundaries, demanding more complex technology and a system manager. The people in the staff position have the same characteristics as the informal provider, except they become powerful gatekeepers and decision-makers.
- Formal: The formal computing services organizations are found primarily in the professional Schools where technology is critical to the mission of the School and its discipline. There is a great deal of variation between the Schools, based on computing applications needed, organizational structure funded, and the demands of the professional market. For example, the level of technology used for instruction in the Graduate School of Education is decided by the type of technology used in the K-12 public schools. Whereas the Graduate School of Design uses sophisticated CAD/CAM software and an elaborate network of computers and peripheral devices to train the design students.

The demands placed on these support providers are similar regardless of the model they fit. Technical expertise helped establish their authority, yet the quality of service was not uniform. Problems and issues identified included difficulty in retaining skilled assistants, lack of space for equipment and personnel, pace of technology changes, inadequate funding, lack of understanding of senior faculty members and administrators of the support demands of technology, increasing complexity of the technology used by a workgroup, the need to "fight fires" rather than being able to control the work demand, and the isolation from other support providers.

The ideal support structure identified by the providers is one where support remains decentralized, whereby first line support is efficient, flexible, timely, and most appropriate when it is discipline specific. A second line of support from a central organization or collaboratory is suggested to provide a variety of supplementary services. Certainly many network-based services warrant support from a centrally managed organization.

Observation 4: Sometimes there is a gap"between a consumer's needs or expectations of support and the services available to that consumer.

Several studies, especially the Faculty Research Computing Study and the HSDN Needs Assessment Study, contain specific feedback from members of the community on the availability and quality of computer support services. Additional evidence from OIT's mainframe computing Help Desk, OIT's User Services Customer Satisfaction Survey, and several anecdotes give rise to reasons why these expectations and quality gaps may exist.

For example, there are parts of the Harvard community that do not have staff or formal support providers. They do not have resources to provide adequate support services. People in

these environments do not have anyone to call on for help. The issue becomes one of "entitlement" to a university-wide minimum level of service that should be routinely available to members of the entire community. The biggest question on this issue becomes one of funding by whom (users or core budgets) and for whom (faculty, staff, students, departments, and/or affiliates).

A gap in expectation and delivery of support arises when someone does not know the person to call on for help. Although there may be many providers, there is little coordination among them. An array of services may be available outside a workgroup but there is no central directory or clearinghouse of services available. Often routing of requests end up in a circular chain of referrals, which occasionally end up with an unhelpful "not my job" dead end.

Another gap arises when a person's regular provider is not equipped to respond to the particular need. Although support providers consider their technical expertise a critical success factor in doing their jobs, they have a finite repertoire of expertise as well as a limited capacity for handling the work load.

When customers become dissatisfied with the quality of service, they begin to expect low quality service and hesitate to request future service from that provider. Key dimensions of quality in delivering support services can be described as technical competence, responsiveness, feedback with status updates, accessibility, affordability, and personal attitude of the provider.

Observation 5: Among support providers, there are potential opportunities for collaboration to help reduce the support services gaps.

Some of the opportunities for collaboration and support for the providers include campus-wide user groups and regular meetings of computer support professionals to share information and to identify problems and issues in search of common directions.

It would be helpful to both providers and consumers to establish a convenient access or "triage" point for those not knowing where to turn. The characteristics of such a function are described under Observation 6.

Another way to provide needed support is to deliver supplemental services through a central service organization to fill gaps in expertise and skills needed by the community. Likewise, mechanisms to assure the quality of the service delivery should be put in place to improve services.

The Academic Computing Support Study lists recommendations in the areas of support structure, funding models, commitment to local support staff, community awareness, and instructional applications support that expand on ways to reduce the user services gaps. These recommendations, focused mostly on OIT, are summarized as follows:

- The support model proposed by the study and described earlier suggests that the local provider be the primary contact point, with second level help provided centrally or through some other coordinated fashion. The planning for this technology support structure, in order to build on existing services, should be facilitated and coordinated by OIT, with collaboration among the managers of technology support.
- Efforts are necessary to update financial and user data and analysis and to improve the measurement and monitoring of technology expenditures. Such data is necessary to back up the planning effort. As demands increase, the limits of the existing fragmented support mechanisms are exacerbated by current funding methods. Concern is increasing over costly duplication of effort and lack of coordinated responses to growing demands for increased funding for support. Any combination of the funding models described under Observation 8 would be appropriate, but they should be coordinated University-wide.
- Local support providers should work together and with OIT to improve communication and knowledge of resources available across campus and to build awareness of the value of support. Regular meetings of support professionals presently sponsored by OIT help reduce the feeling of isolation described by computing support staff.
- OIT should work to improve community awareness of technology and value of technology support through its publication and information services to the University community. Through its publication, *Technology Window*, OIT could build the visibility of support providers. More collaboration with academic Departments and Schools for the OIT colloquium

series may help increase attendance at these educational events. Better on-line referral services and directories will enhance community awareness.

- Efforts are necessary by Departments and Computing Services staff to improve opportunities for faculty to become familiar with instructional uses of technology and to support development of instructional applications for integration into the curriculum. The recent report of the Harvard Assessment Seminars notes that "an enormous number of faculty are eager to innovate in their teaching,"[1] but that a major stumbling block, when it comes to technology, is the lack of support to develop and integrate the technology into the classroom. "In the course where a technological expert is available to work with a professor, the curriculum changes can be dramatic." [2] A few efforts are presently under way within the Faculty of Arts and Sciences to support instructional applications, but OIT should foster others.

Observation 6: A computer support/user services function can be looked on as a system with several capabilities.
The capabilities suggested for a triage system are:
- ability to respond to a minimum set of support requests and issues on the spot (a telephone hotline)
- ability to dispatch or reroute a request to the right provider without further action by the consumer
- mechanism to capture information about the support transaction
- follow-up procedures on transactions that are not completed and closed on the spot.

Observation 7: The support services delivery mechanism can be improved.

The University's support services delivery mechanism is distributed and very diverse. Ways suggested to increase the efficiency and cost-effectiveness of the delivery mechanism are to reallocate current resources, improve collaboration in use of current resources, and train end-users to be more self-sufficient.

It is also possible to use the technology of expert systems to facilitate and automate the triage function. The University of Michigan has used its computer network to route questions, analyze the response time, and remind support people who do not respond in a timely fashion. Such an automated triage function is more cost-effective than a person-intensive tracking system.

Observation 8: There are generally three possible methods for funding costs of support services.
The three common methods of funding support costs are:
- *fee-for-service*, either on a per-call basis or through subscription/service contract
- an *overhead charge* included in the price of other services
- a *tax (assessment)* on the community in general.

Obviously, key issues are who pays for support services and how. In the aggregate, a large sum is already being spent for support as mentioned in the Academic Computing Support Study. Two million dollars of the over $60 million expended on information technology in FY90 was identified by the small sample of support providers as being spent for academic computing support. Are current resources being deployed effectively, what level of additional funding, if any, is needed to address support issues, and where should that funding come from? Everyone agrees that a combination of the methods described above may be appropriate to answer the need for greater and more equitable funding of computing support services. Whatever the solution, the implementation must be coordinated.

Several recommendations for the implementation of a technology support infrastructure for Harvard have been defined. Likewise several components of OIT's role in the planning and support process have been described. As a non-subsidized organization within central

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[1] *The Harvard Assessment Seminars: First Report* 1990, Harvard University, Richard Light

[2] *Ibid.*

administration, OIT provides optional computer services, which are usually fee-based. It also serves as facilitator and coordinator of meetings and events, collaborator on projects and vendor activities, advisor on technology developments, researcher and planner about technology use and support, and educator through its training program, sponsored educational events, and publications.

III. Publications in a Distributed Environment

The general function of publications is common knowledge: they are important for disseminating information, educating the community, and alerting readers about upcoming events. How important publications are in rendering an academic technology vision may not be as obvious, however.

Is it necessary to develop and implement serial publications to deliver technology at the university? Surely people who need telephones will purchase and use them, and those who require large amounts of number calculations will purchase major computers or computer services. Usually faculty, researchers, and administrators will also allocate money in their budgets for such items and learn how to use them when necessary. So why do we need publications to help render an academic technology vision, a vision in which communication and collaboration are essential elements?

Communication

People at a university are familiar with the importance of communication, the need to describe ideas in language, the need to put complicated thoughts into words. The university is a world where people are used to writing down their ideas and to reading the ideas of others. It is a world in which communication is essential, and in this world publications can be important windows of communication. Like windows, the ideas represented and described in publications can be made transparent (at least to the extent the ambiguities of language permit). Also like windows, publications can reflect trends or new ways of thinking, providing a specific framework for general perceptions.

In the world of computer technology, the idea of windows has taken on an additional meaning. It is understood as pointing to a specific visual reality: windowing environments, windowing interfaces, multiple windows, lending to the window concept the idea of ease of use and a clearer understanding or more "intuitive" way to access applications or files. Because language and word usage change over time, this new meaning for window has now become another part of how people understand the word. When I use the window metaphor for publications, transparency and reflectivity are understood, but so is ease of use. As windows to the university, publications can be quick ways to find out about events, people to contact for information, and telephone numbers for support and services.

In a distributed environment, especially one like Harvard, publications serve as a very important resource for gathering and disseminating information about various efforts in the many independent Schools and Departments that make up the University. There are a number of local publications issued by individual Schools, and there is one official campus newspaper, the *Gazette*, but before the Office for Information Technology (OIT) began its major publications effort some four to five years ago, there was no central resource for disseminating important technology information to the community.

Historical Background of OIT's Serial Publications

Today there are three major serial publications: *Technology Window*, a monthly tabloid distributed to every faculty and staff member and by drops to students, the *Information Technology Quarterly*, a scholarly technology journal with a national reputation, and *OIT Notices*, a quarterly how-to publication for people who use technology daily. Although the *Quarterly* was begun about nine years ago and was recognized then as valuable for its scholarly treatment of technology, only in the last few years has it developed a national following.

Each of the publications serves a different function at the University. The *Window*, with its circulation of 25,000, is the most visible of the three. Each issue contains articles that focus on different areas, disciplines, and Schools, in addition to regular features publicizing OIT efforts, an important statement from OIT's Director, a monthly calendar section, a question and answer column, and support and service telephone numbers.

The *Quarterly* usually highlights a single issue of current concern to people who use information technology. Fall 1990 was devoted to Distributed Computing, Spring 1989 covered the Senses of the Computer, and Fall 1988 dealt with Teaching with Computers.

About eight years ago, *Notices* started life as a publication very different from what it is today. At that time it was called *Computing Center Notices* and contained information only about hardware and software changes and updates on the OIT mainframe. It served the important function of informing people in administrative offices who depended on the mainframe for computing the type of things they needed to accomplish their tasks. The publication was issued irregularly, being driven solely by the need to disseminate specific update information, and had a restricted audience.

With the growth of OIT over the past four years, especially in the areas of telecommunications technology and networks, and the increasing importance of personal computers and local area and high speed networks at the University, there was a need for a more regular publication containing specific information about technology that was not restricted to the mainframe. Over the past four years, *Notices* has come to include information about every technology OIT supports: telephones, facsimile machines, copiers, the Technology Product Center (the retail computer and software outlet), training and informational events, information about new and existing local, regional, and national networks, software and hardware descriptions and tips covering microcomputers, minicomputers, and mainframe updates, as well as information about technology published in other academic newsletters around the country. In fact, *Notices* has even started to include think pieces about common technologies, how they are being used at the university and where they may be heading in the near future.

Publicizing the University Networks

With the installation of the digital 5ESS switch at Harvard, the University became the purveyor of ISDN telephone service to all offices and dormitories. The effort represented a major change in the way telephone service was delivered. Previously New England Telephone had been responsible for the telephone service, but the old analog system was becoming inadequate to University needs, and since more advanced technology was needed, it was decided to go with a system that could be developed, administered, and maintained "in-house." OIT, as the Department responsible for the Harvard Telephone Office and other types of central digital technology, was given the charge to develop, implement, and maintain the ISDN service. Shortly thereafter, OIT also embarked on developing and implementing a high speed data network. Both major efforts were viewed as parallel and were developed during the same period. For the projects to be a success, it was vital to have the cooperation and commitment of all areas of the University.

The OIT publications were used to inform the community at all stages of the projects: to describe what was about to take place, how and when it would affect people, University-wide efforts to discover what the needs of different Schools and Departments were, what the various components of the technology were and the different uses they served, and to provide updates about the progress of the networks at each stage. Not unimportant, although somewhat "low tech," was an article in *Window* describing each of the new telephone instruments that would be available to the community, including features, cost, and a photograph of each. It was an immediate, direct way for people to see what was being offered and for them to have an opportunity to think about the different options before having to make their decisions.

The *Quarterly* also devoted a major issue to the ISDN and HSDN networks coming to Harvard. It contained interviews with the major players, in-depth explanations of current technologies to be used in the projects and why they were chosen, advantages and implications for future growth, and a glossary of many of the acronyms and technical terms. The issue was so successful it "sold out."

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Notices emphasized particular technologies, describing in lay terms how to use each, including a list of the new telephone training sessions for the various Departments and Schools, and how to become a network subscriber. It was in this publication that a simple, detailed explanation of which kinds of applications would be most suitable for the ISDN and which for the HSDN network appeared, and it was in *Notices* that a description and diagram of the TCP/IP suite of protocols were presented to the University community.

Regional and National Networks

When the BITNET network was the most popular one for communicating with colleagues both nationally and internationally, *Window* publicized information about who to contact for information in the context of articles describing particular academic efforts at the University: BITNET at the Center for Astrophysics, BITNET at the Cyclotron Laboratory, funding and organizational changes on the organization's fifth anniversary, as well as featuring a question and answer column describing how to use the store-and-forward network. *Notices* disseminated information about BITNET representatives at the University and the availability of a BITNET guide and cheat sheets for using the network from various Schools, each of which provides support for its own system.

In early 1989, when NEARnet, the New England Area Regional Network, was first formed, *Window* announced and described it to the University, and ever since the publication has followed NEARnet progress, both its acquisition of new members and hardware upgrades as well as articles outlining resources as they become available on the network. These include general research applications such as library catalogs and applications geared to particular areas or disciplines such as medicine and biology. With the acceptance of the New England proposal to be a network node on NSFNET, the national science and research network, an announcement in *Window* was considered a matter of course.

Today people expect to find such information about vital technology developments in the OIT publications: for those who know about it in advance, they look for details in *Window*; if the item is news, they scan the articles to see if the project is of interest and call the contact person who is generally listed at the end.

Information about the efforts of the Coalition for Networked Information, formed by EDUCOM, CAUSE, and the Association of Research Libraries (ARL), is also published in *Window*. The new organization's work to promote standards, develop joint approaches to knowledge management, and to lobby for a technology infrastructure to benefit national research and education was the subject of the From the Director column in December's *Window*, as were pilot projects being formed to use new digital printing technology across the University. In this feature, the publication serves not only to keep the community abreast of national networking efforts, it also publicizes new interdepartment pilot ventures and lists people for interested parties to contact so they can participate in the collaborative project.

The *Quarterly* devoted an entire issue to national and regional networking issues. Again interviews with important players were published, as were maps of the networks, in-depth pieces about the technology—current and future—as well as pending congressional legislation and a statement by Senator Albert Gore from Tennessee.

When NEARnet became operational in the summer of 1989, *Notices* described the connections then in use, the academic and research players, the network that was "going away" (ARPANET), and the technical details of the current connection. The article also detailed the supercomputing connections and the proposal for New England to be an NSS, or NSF node.

Important to the University was the early publicity of the various networking efforts, the contact people or facilitators for each piece, the updates and progress reports, and the general and specific catalogs of available resources. Nowhere else could the community find this type of information regularly, and the continuing publicity played no small part in the successful implementation and use of the networks—local, regional, and national—at Harvard.

The Libraries

Although the University libraries are a separate organization and independent of OIT, they do use the OIT mainframe for storing information for HOLLIS, the Harvard On-Line Library Information System. Articles and features in OIT publications regularly give publicity to the libraries' efforts to develop and implement the electronic catalog and to each new feature as it becomes available. Automation efforts for major individual collections are also described, not only to inform the community about the availability of electronic access, but equally important, to inform people about the varied resources in the collection. One such piece in the June 1989 issue of *Window* described Harvard's Judaica holdings, one of the premier world collections.

In addition to listing contacts for further information about resources accessible electronically, as well as particular technology efforts being spearheaded by the libraries, OIT publications maintain a close working relationship with key library people. The relationship is important for both parties. When there was a concern about network access to HOLLIS, we were able to play an informational and mediating role. When OIT recently upgraded its two IBM mainframes to one 3090 machine and carried out a series of operating system software upgrades that affected the libraries as well as other major Departments, the publications were important for communicating the upgrade and changeover information, the schedule at each stage, and the implications for those using the system.

The libraries know they can count on us to disseminate the information clearly and sympathetically to the entire community in a regular timely way. The editors of the publications know that whenever an item of significant technological interest occurs in the libraries, they will receive information about it. And of course, the Harvard community knows that such information is to be found in the OIT serial publications.

Most recently, *Window* featured an article about "Slow Fires," the major information preservation exhibit at Widener (the central University collection) starting in December. The article described the threat to books published over the last 100 years and some of the technology, digital and microfilm, now available to preserve and distribute information from the threatened volumes. As part of a pilot for the National Endowment for the Humanities, three Harvard libraries, the College Library, the Business School Library, and the Law School Library, will be engaged in a 3-year program to microfilm about 25,000 deteriorating books at the University. Coordinated by the Preservation Office, the effort is a national one, involving close cooperation not only among several internal Harvard Schools (a major feat), but coordination and collaboration with national library organizations such as OCLC (the Online Computer Library Center) and RLIN.

Cutting Across Disciplinary Boundaries

Because Harvard Schools and Departments are locally governed and administered, the term "distributed environment" refers to more than just technology at the University. The independence of each area creates a climate in which it is difficult or nearly impossible for a faculty member or researcher in one discipline to hear about parallel work taking place in another, even though it may be happening only a few yards away. Publications can bring people together by writing about individual efforts. An article in the May 1988 issue of *Window* about tiling symmetry and crystals at the Department of Visual and Environmental Studies proved to be of interest to people in computer science and in physics. A later piece in October 1989 describing computer efforts to "grow" quasicrystals brought in a researcher working in mathematics to this newly-formed network.

Two more recent *Window* features (September and October 1990) brought researchers in structural biology and in art conservation together. Both were using computers to analyze crystal structures: biologists were using the technology to study molecule scattering, art conservators were using it to determine the composition of pigments. It is surprising how researchers in different, totally unrelated disciplines can sometimes use the same or similar technologies to assist them in their work. For the quasicrystal and crystal studies, none of the researchers was aware of the work being done by the others until the articles appeared in the publications.

The reporter/editor discovered the value of the first feature when the Fellow in physics telephoned to thank her for publishing the information. The fact that similar technology was being used across disciplines became apparent in the course of the interview with the art conservators.

Upon realizing the potential use and general interest in computational programs for analyzing diffraction patterns, the editor suggested to the person responsible for organizing OIT colloquia and educational events that others might want to know of these efforts, and the conservator was invited to demonstrate his applications as part of a recent Faculty Forum on technology projects across the University.

Publicity and Support for Education and Training Within the Department

Since the inception of *Window* in 1986, it has been perceived as an important vehicle for publicizing the OIT education and training effort, which was then just getting underway. *Notices*, too, has been used to publicize these events. Each semester the OIT Training Catalog is published as part of the September and January *Windows*. Supplementary training events, such as special demonstrations or workshops, that are not part of the Catalog are listed in the monthly *Window* calendar and in a separate section of *Notices*. Colloquia, which are also part of the education effort, are not only listed in the calendar, if they seem to be of special community-wide interest, they may be prominently featured before the event occurs. In addition, a reporter usually attends the event and writes an article describing it for *Window* after the colloquium takes place. Most recently, December's issue reported on the colloquium about electronic communication and political freedom, with panelists Mitchell Kapor, Eugene Spafford, and Harvey Silverglate. In the same issue there was an article reporting on the Faculty Forum, another important OIT educational event.

Similar publicity is accorded educational efforts by other groups within OIT. The Applications Development group, under the leadership of Assistant Director Milly Koss, regularly holds monthly Special Interest Group meetings, which are publicized and often reported on in OIT publications. Equally important were publicity efforts for a new HUBS service (Harvard University Basic Services), an inexpensive, easier-to-use electronic mail system developed by OIT's Information Services Division. Not only was the service described in *Window* and *Notices*, but the schedule of demonstrations for the new interface was listed in the publications.

The Changing View of Technology at Harvard

From the perception that academics who wanted to purchase technology were on their own and had to find out what information they could from trade journals, occasional chance conversations, or trial and error; from the view that one purchased what one could afford at the time, and that training was unnecessary, and in any case, not included in the budget; from the sense that each School had to provide whatever informal or formal support it could; Harvard is beginning to change. Technology, like everything else, is not centralized, but the information technology providers and users are increasingly coming to feel like a community. There is consultation, support, and advice for major and minor purchases; Departments and Schools are being helped with planning for technology purchases, training, and use; and OIT education, training, and publicity efforts are becoming known as important and recognized elements of University life. In all these areas, OIT publications have and will continue to play significant roles to inform, publicize, and bring together a distributed community.

As the Harvard community collaborates with OIT to define its vision of academic technology further, a University-wide plan may evolve and be implemented in the near future.

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A FRAMEWORK FOR DISTRIBUTED DECISION SUPPORT

by

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In this paper, the development of a framework for distributed decision support at a large, public, research university is described. During the past six years, North Carolina State University has moved from an environment of several independent units providing decision support services in an ad hoc manner to a coordinated function. The key success factors have been effective implementation of advancements in information technology and the organizational relationship between institutional research and information systems. This arrangement has resulted in the development of data standards, the creation of information, and has provided users with reliable data sources and flexible tools for accessing the data. A case study approach is used with comments about future directions for decision support.

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INTRODUCTION

North Carolina State University (NCSU) is a large, public, land-grant university which has extension programs in all 100 counties of the state. The 1990 fall enrollment was 26,683 and 4,212 degrees were awarded in the same year. Funding for research has increased significantly during the past ten years to over $158 million in 1990. The NCSU organizational structure includes ten colleges (the term college is used throughout this paper to refer to NCSU academic sub-units).

Paralleling the tremendous growth experienced by this institution has been an increasing demand for information, both internal and external to NCSU. This paper describes the development of a more distributed process for decision support through the changing relationship between institutional research (IR) and information systems (I/S).

The first section of this paper is presented from the IR perspective, which includes a discussion of the previous environment, decision support requirements, and the present organization. In part two, the technical elements are described from the I/S perspective; this discussion involves the following topics: an overview of the networking developments during the past two years, standard extract files, data management procedures, and future directions. Finally, a summary of key points is presented.

PREVIOUS ENVIRONMENT

At NCSU the development of application systems for decision making were typically a spinoff of external reporting requirements. Applications systems were developed independently, initially to support the reporting mandate. As the reports became a standard part of the routine data generated for IR, information was developed in line with the policies and guidelines of the University. This information was then provided to decision makers in hard copy reports. Programs were usually written in COBOL or PL/1 and required support from I/S to make changes. In general the decision support files were generated from the operating files upon request and over time did not provide a consistent picture of the University. Documentation was usually written for computer professionals. As such, end users were dependent on computer professionals for modifications or enhancements; all requests for changes were placed in the applications development queue.

This often resulted in inconsistent and/or incomparable information from year-to-y-ar. Since ad hoc reports were generated from a queue through I/S, decision support information was often untimely. In addition, the resulting information

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was often not what the decision maker needed as the wrong question was asked or when asked correctly was interpreted incorrectly by either the IR analyst or the programmer.

DECISION SUPPORT REQUIREMENTS

A director of institutional research was hired to develop a University-wide decision support function. The first concern to be addressed was that of data quality. To accomplish this, the following were put in place:

- Reliable Data
  - Schedules for census file creation were developed for all operational data bases
  - Administrative and academic organizational structures were linked by cross-over tables
  - Independent application systems were linked by organizational cross-over tables
- Valid Data
  - Consistent definitions were developed across institutional organizations and application systems
  - All University reporting requirements were to be supported by these files
  - These files were the source for all institutional data and information used in University planning and decision making activities

Primary in the development of reliable and valid data and information is the consistent use of census files. Census files are a "snap shot" of the institution's enrollment, personnel file or any other operational file at a consistent point in time each academic term or calendar year. It is important to note for student related data that the time of the census file creation be consistent with the academic calendar. In all cases, it is critical that the time frames for creating these files be agreed upon by all parties and reviewed annually.

Critical to the functioning of the IR office is the ability to independently access the census files and manipulate the data. As such the Statistical Analysis System (SAS) is used for all data analysis applications. In addition, any new reporting

systems or rewrites of existing systems is done in SAS. As all members of the IR staff are proficient in the use of SAS, minor modifications can be made in-house. The ability to move in this direction is the result of a dedicated resource from I/S to support the IR function.

PRESENT ORGANIZATION

In the present organization, the administrative application systems are the responsibility of I/S. Data Stewards, individuals on campus such as the registrar (student data), are responsible for approving access to the data and the quality of the data in both on-line systems and files extracted from these systems.

The delivery of data and reports to external sources is the responsibility of IR. These reports are prepared from the census files mentioned above. Improvements in the consistency and integrity of data published about the University have resulted from enhanced cooperation in the working relationship between I/S and IR. This relationship brought the analytical and technical staff of the University's decision support function together. The result was the development of systems that provided the needed flexibility to respond to the ever changing information needs of the University's administration.

RECENT NETWORKING DEVELOPMENTS

During the past two years significant work has been accomplished in the development of a fiber communications infrastructure. In the summer of 1989, the first inter-building administrative local area network (LAN) was implemented. Today more than 200 administrative users in seven buildings are able to communicate across a fiber backbone to access mainframe and LAN services.

The advancements made in the fiber and LAN technologies have provided a foundation for improvements in decision support capabilities. Users are able to download extract files from the mainframe much faster than before through channel-attached access. Standard extract files are also downloaded periodically to file servers on the LAN for processing by end users.

The administrative LANs use the Novell network operating system with a variety of application software, much of which is specifically designed for operation on a network. Paradox and dBase III+/IV are used for reporting and data manipulation.

STANDARD EXTRACT FILES

A set of standard extract files was proposed and studied in Spring 1989, with the programming and implementation in Summer and Fall of 1989. The intent of this system was to provide data from mainframe systems at NCSU in a format and size useable on a microcomputer. The major users included administrative staff in each Dean's office and some offices involved in central administrative support (eg. Budget Office and IR).

The data in the extract files is a subset of that available through the on-line, interactive systems, including student demographics, course rolls, admissions, personnel, financial, and facilities. Only the student demographics data is available in a census file format. The remaining extracts are generated from production systems which change daily. Users are cautioned to be sensitive to the source of data studied. After the appropriate security is authorized, processing of the extract files should be handled by a contact person in the Dean's Office of each college. Data distribution to departments and individual faculty members is handled through a central office contact person. Each record of each file contains an organizational unit code (a unique identifier for each department) for separating departments, where appropriate.

Access to these extract files is available from the administrative mainframe using one of two methods: 1) file transfer using Arbiter or 2) batch file transfer using FTP (TCP/IP file transfer). A microcomputer application, written and compiled in Clipper, is provided as a basic tool and a starting point for staff using the Arbiter option. This software is an automated, "user friendly" method of converting the data into a dBase file format for further processing by the end user.

This system of extract files is intended to be an evolutionary process that refines over time the data structure and delivery technique. This statement means two things. First, that the basic structure and definitions of new extract files must be compatible with earlier versions. Also, delivery methods may change over time as the University computing environment changes. Second, that there be a periodic, in this case twelve month, review for usefulness and completeness.

DATA MANAGEMENT PROCEDURES

A data management procedures document entitled Data Management Procedures (Ownership, Access and Security), was developed by I/S and approved by the Chancellor in January 1990. These procedures provided the vehicle by which full implementation of the extract files could proceed. All media (paper, microfiche, and computer readable) for distributing University data was covered through this document. The purpose of these new procedures follows:

"This data ownership and access procedure is based on the realization that North Carolina State University is critically dependent on its computer systems and the understanding that standards and procedures are necessary because of the storage of large quantities of information within a system and the ease with which such information can be manipulated, retrieved, transmitted, or compromised."

"Implementation and adherence to precise standards and procedures for electronic information processing operations are necessary for the protection of University information. The formalization of this data ownership and access procedure will provide the foundation upon which the necessary standards and procedures for protection of University information assets will be developed."

As part of this procedure, a "University/Data Access Compliance Statement" was created that places the ultimate responsibility for correct use of University data on the individual. The form lists specific items of data considered public information and reserves all other data as confidential. The form also describes violations and some possible penalties. The employee requesting clearance must complete and sign the form as part of the authorization process for accessing extract files and other University information.

FUTURE DIRECTIONS

During the next six months I/S staff will begin the development of a "glass house" which will include the capability for storing and accessing extract files from a server rather than the mainframe. The file server may also provide a solution for information requirements beyond extract files, such as the repository for an executive information system.

A major consideration in the development of this new capability is the availability of an SQL database server with multi-platform accessibility (eg, DOS and TCP/IP). The user interface for any executive information system must be simple and easy to use with quick access to an aggregated view of the University databases.

As part of this effort to develop an executive information system, users must be educated on how to access and interpret the data available to them. Effective training for all levels of staff involved in this process is critical. Better documentation and the use of on-line help facilities (we have implemented some of these capabilities using Folio Views) is also important to user education.

Regardless of the technology used, standard definitions of the data must be developed. Software tools which use standard methods of access and manipulation

of data are also important.

KEY POINTS

Based on the experience at NCSU, the following key points need to be recognized:

1. Moving to distributed decision support is an evolutionary process that starts with an emphasis on data integrity.

2. Procedure(s) for data management - ownership, access and security must be developed.

3. An information technology plan must be developed in order to provide direction in the creation of distributed information.

4. It is very much a people process and natural tensions will surface.

5. All users have to be educated, committed and involved in the development of a distributed information function.

Distributed Information for Decision Support: Standards and Processes

Summary of a Panel Discussion at CAUSE90

Richard H. Howard
Director of Institutional Research
North Carolina State University

Gerald W. McLaughlin
Associate Director, Institutional Research and Planning Analysis
Virginia Tech

Karen L. Miselis
Associate Dean for Administration
University of Pennsylvania

This session used a skit and audience participation to demonstrate a procedure for looking at issues related to providing distributed information for decision support.

First, the Information Circle, a five step model of information support was presented and briefly explained. This model has the steps of

(1) Identification of the measures,
(2) Capture and storage of data,
(3) Manipulation and analysis of the data,
(4) Distribution of the resulting information, and
(5) Influence and use of the information.

These functions form a circle where influence and use of the information should cause selection of the next set of measures. Next we presented a procedure for using the steps in the circle in a group process to discuss and analyze problems using the five functions, select the key problem, reanalyze for causes, and develop a strategy. After the brief explanation of the circle and the process, we then told the audience that they were to participate in a problems-solving process—a brief skit would present an information problem that included issues from the various steps in the Information Circle. They were given copies of the Information Circle and were asked to keep notes on the problems presented by the skit.

The skit illustrated issues which need to be worked through when information is developed from central data bases and distributed to different decision makers. Karen Miselis played the part of a decision maker at the college level and Richard Howard played the role of the central institutional research director. Gerry McLaughlin was the moderator.

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At issue was the usefulness of an outdated teaching load report which still met the needs of the president but fell short of meeting the planning and operational needs of the college administration. Specific concerns which became apparent in the discussion between the two administrators included:

- timing of the availability of required data bases
- the utility of the report for different purposes by different components of the university's administration and requiring different variables from those that were currently available
- the level of computing expertise required to access the data for the development of useful reports.

The group was then led through the steps of the problem solving process in order to resolve the problems and issues which they had noted in the skit. Key problems, such as timeliness of the data, were identified and discussed. The presenters then summed up some of the issues whish they saw in providing data to distributed users and noted some possible solutions for these problems.

Coordination of Distributed Activities

by
A. Wayne Donald
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Information technology provides many opportunities for new and exciting initiatives on our campuses; however, a lack of proper management will only contribute to eventual failures. Distributed activities must revolve about a point of central coordination to ensure support for overall institutional goals. Distributed technologies should not be discouraged, but solutions created for specific areas need not, at the same time, diminish support of institutional systems.

This presentation reviews experiences with distributed activities for administrative systems at Virginia Tech, deficiencies that have emerged in administrative systems and the management process, and steps that have been taken to create an acceptable infrastructure for administrative systems. Administrative Systems Planning was established in early 1990 in the business and finance area to provide coordination and direction for administrative systems. The development of a strategic plan, encompassing methodology, standards, and a participative planning process are among the items covered in this presentation.

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An Era of Change

Economic, political, and social transformations have caused significant changes in higher education during the past decade, and predictions for the 1990s are even more phenomenal. In terms of administrative functions, the escalating cost of higher education will force institutions to find ways to do more with less. Governmental involvement in funding activities and regulations will challenge institutions to meet specific demands that will require innovative solutions. With the always present concerns about demographic changes, aging physical structures, global competition, operating budgets, quality education, and so on, higher education is in for an arduous decade.

Many institutions are meeting these never-ending changes and demands by requiring that administrative areas be more efficient and effective operations. Organizational structures are changing in many institutions to simulate what has been happening in private industry for a number of years, that is, flatter structures with more point-to-point relationships.[1] Providing accurate and timely information is critical in day-to-day operations and in the decision-making process. Technology that is changing at a rapid pace provides institutions with opportunities to meet these many challenges with advanced, technological alternatives.

Information Systems Environments

Describing information systems in higher educational institutions today is difficult because of the diversity. The centralized environment has been prominent for years, and, with the emergence of the Chief Information Officer (CIO) in recent years, the focus rests on consolidating various information systems with media services, communications, and the libraries. However, the centralized environment may be classified with terms such as decentralized, distributed, and, more recently, downsized. The information systems environment is a combination of these types of environments at most institutions of higher education, and such a scheme will likely persist during the 1990s.

I would choose *distributed* as the key term in defining various activities associated with information systems since this term implies the idea of scattering, spreading out, or putting items in distinct places. Even though distributed computing is often used to describe an information systems environment, it is unclear whether distributed refers to processing, databases, development, or resources. In many cases distributed refers to a combination of these. Whatever function the term describes, the technology of distributed activities provides the institution the opportunity to design its systems to operate in the same manner it conducts its business.

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[1]Jim McIntyre, "Spinning Into The 1990s," NACUBO Business Officer, January 1990, pp. 24-30.

As institutional structures are modified to respond to changes in the 1990s, information systems will likewise be altered to serve the needs. Technology will provide opportunities to be innovative and to create distributed environments that enhance every facet of the educational process in academics, research and administration. Caution will assure that these distributed environments are focused on a common goal of fulfilling the institution's mission.

A Movement to Distributed Activities

Distributed or decentralized actions were a popular trend in the 1980s in many areas. Business and industrial arenas offer many examples of distributed activities, many of which can be attributed to the highly autonomous structure of business. Individual business units were given responsibility for their own field operations and each developed its own information systems strategies, standards, plans, and controls.[2]

An example from higher education is Stanford University. It underwent a major reorganization in 1987 when application support programmers were moved into the line organizations. The University of Wisconsin/Stevens Point went one step farther when it eliminated the central computer center and distributed the hardware and all facets of the computing operation to administrative departments.

Perhaps Virginia Tech was ahead of its time when the decision was made 20 years ago to distribute certain responsibilities for administrative systems. Operational and maintenance functions were assigned to administrative offices, and each office was also responsible for securing personnel to staff the support function. This distribution allowed the central development staff to focus on new development and major enhancements for administrative systems. At first the idea was not well received, but certain advantages made the transition attractive to administrative offices and central resources.

> Systems personnel located in administrative offices would create a sense of ownership, pride, and responsibility in the offices.
>
> Departmental control (to a certain degree) over operational and maintenance issues would result in quick resolutions.
>
> The systems personnel would provide a needed level of expertise to business functions in the administrative areas.
>
> Management and staff in the administrative areas would have the opportunity to learn more about technical issues associated with administrative systems.

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[2]Ralph Carlyle, "Martin Marietta Flies in Formation," Datamation, August 15, 1990, pp. 85-87.

Distributing activities in these various environments was, in many cases, a natural progression because distribution would provide a degree of freedom that enabled the organization to function independently and to satisfy specific needs.

An Evaluation for the Future

Business and industry, as well as higher education, are operating in an era of constant change, and these changes are challenging organizations to evaluate all phases of their operations. Management is being directed to provide more efficient and effective operations and to discover ways to do more with less. A focus on the organization (or institution) as a whole is being emphasized in all units, from planning to operations.

Coordination was lacking for the distributed activities at Virginia Tech, as is true for many of the other movements in this direction. The premise was that areas would take care of themselves and an informal network would keep people in contact. This concept may have worked in some environments, but uncontrollable growth and changes in procedures have resulted in unacceptable distributed activities in most cases.

Many of those organizations that took the plunge in the 1980s now have major concerns. As was so amply described by one world-wide company: "...after a decade of allowing independent business units to call their own information systems shots, many companies are realizing that they are stuck with a variety of inconsistent technologies and no way to forge enterprisewide applications. While Humpty Dumpty is in pieces, managers can't get a unified view of their business, an essential requirement for a market-driven company and a global competitor."[3] Isn't this also characteristic of many of the distributed systems find in higher education institutions today?

Uncertainly still exists about the reorganization at Stanford. Prior to the reassignment of programmers to line offices, a stable organization worked together to assure consistency and integration. Even though these individuals have now been distributed, they cooperate to avoid creating isolated environments. Fortunately, Stanford has had only one significant personnel change during the past three years. Another advantage in the Stanford situation is that certain support services have remained within a central group that serves all administrative systems. Excellent personal communication among the individuals involved with administrative systems and central support services has eliminated any significant problems at this point. One concern at Stanford has been that the movement of programmers in the administrative

[3]Ralph Carlyle, "The Tomorrow Organization," Datamation, February 1, 1990, pp.22-29.

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offices may be restrictive, that is, programmers do not have the opportunity to work in different areas and their career paths may be hindered.[4]

The University of Wisconsin/Stevens Point used a committee to coordinate its initial efforts in distributing responsibility to administrative offices. Stevens Point felt this was cost-effective since the campus-wide network offered the opportunity to locate each application in its operating environment. Moving the hardware out on the network was the easy part. Concerns that have initiated a review of this structure are a lack of consistency, difficulty in integrating administrative applications, and costs (because of the duplication of some services).

In addition to these examples, a number of unfavorable observations can be made about the distributed environment for administrative systems at Virginia Tech. Even though a central systems development staff is still located within the Information Systems organization, its role is to provide development and implementation support to administrative offices and to initiate strategic projects to benefit the institution as a whole. Individual administrative offices continue to have primary responsibility for administrative systems, but, in recent years, individual staffs have grown beyond the initially envisioned operational and maintenance roles.

A thorough analysis of current administrative systems at Virginia Tech and the supporting organizations uncovered the following points:

> A lack of central coordination for distributed activities results in poor planning, duplication of efforts, a lack of integrated systems, and inconsistency.
>
> Certain areas operate in a vacuum and give limited consideration to issues of a global perspective. A limited sense of synergy exists for the administrative systems environment.
>
> Certain administrative areas are unwilling or unable to provide a support staff and rely solely on central resources.
>
> The definition of roles for specific personnel is unclear in administrative offices that accept responsibility for administrative systems, and in the central resources.

How administrative systems and the distributed activities are perceived vary from one group to another. Individual administrative offices may be content that most systems are meeting their needs. However, users outside that administrative office have a different opinion. The global view reveals that the lack of coordination for these distributed activities has created an environment that is fragmented, undependable, and nonresponsive.

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[4]Personal communication, Ced Bennett, Director, Application Support Center, Stanford University, November 9, 1990.

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Coordination for Success

This discussion is not intended to discourage distributed activities nor to imply that all distributed efforts are failures. On the contrary, successful distributed operations indicate that distributed functions are a permanent organizational structure. Some form of distributed activity may be prominent in almost any organization in the next decade. Many organizations, such as Virginia Tech, must react to the situation and correct problems they have encountered. This will provide those facing this inevitable change to their environment the information needed for planning and moving forward with an infrastructure that assures success.

The difference between failure and success for many distributed activities is coordination. A recent article on the issue of downsizing indicated that one way to avoid failure is to have a controlling framework or infrastructure. The author further states that "the more dispensed the technology and the people are, the more important coordination, coherence and consistency become -- especially as power users and similar constituencies start deploying sophisticated departmental systems of their own."[5] This applies to distributed activities, as well as mirrors the environments of many organizations.

Many challenges are facing those responsible for making a decision on distributed activities. If an organization is to have successful distributed activities that support a global mission, there must eventually be a point of central coordination. The type of organization and what is expected from distributed activities will help determine how the coordination function fits into the structure. Management support is essential, and all personnel involved with distributed activities must understand their roles, responsibilities, and how they interact with the central coordinating function.

Responding to the Need

Business and industry are reacting to the problems of distributed, incompatible, inconsistent, and often out-of-control information systems by increasing the control and coordination of their activities. Although distributed activities will continue to increase, more emphasis must be placed on standards and the integration of systems. If the information in an organization is not shared and used in a uniform manner, it loses value. To assure that a highly integrated environment is present and that information needs of the future can be met, business and industry are turning to chief information officers, integrated project teams, and corporate information planning functions.

Stanford University is making few changes in its environment because the people involved with the systems are communicating and there is a certain amount of "informal" coordination. Regular meetings keep people informed,

[5]Theodore P. Klein, "How to Avoid the Five Biggest Downsizing Errors," Computerworld, June 11, 1990, pp. 91-93.

and the central organizations arrange seminars to explain new initiatives and future projects and plans.

The hardware and applications are still distributed at Stevens Point, but other changes have been made to better serve administrative systems. Programmers have been moved into a central organization that coordinates and supports activities for administrative systems. An increase in the integration of distributed administrative applications has also prompted Stevens Point to recently establish a new campus-wide data administrator position.[6] This individual is responsible for university data across all systems.

Virginia Tech has been pondering its situation for the last few years. The interest has been in creating an environment where distributed activities are not necessarily discouraged, but solutions created for specific areas do not, at the same time, diminish support of institutional needs. The Information Systems organization has insisted that administrative offices be responsible for administrative systems. Although objections to this philosophy are not intense, problems do exist in the current structure.

Administrative Systems Planning

Administrative offices at Virginia Tech have continually accepted increasing responsibility for planning, developing, and operating administrative systems in their areas. Subjective strategies in individual offices have often resulted in systems that were designed for solving problems in an isolated environment. This situation has resulted in fragmented systems and increased the possibility of risks in terms of costs and inadequate systems. Such an environment can be attributed to the lack of any centralized direction and coordination for these distributed activities. Users at several levels feel Virginia Tech is lacking a formal planning activity, a uniform process for implementing systems, specific standards to enhance integration, and strategic directions for administrative computing.[7] Not only is there a lack of teamwork by the various "players," there is also no manager for the team.

Administrators at Virginia Tech have been somewhat cautious about this situation, out took an initial step in early 1990 when they established an administrative systems planning function. The initial announcement for this new function indicated it would be charged with developing and maintaining a comprehensive and coordinated plan for administrative systems throughout the University. Part of the charge was to provide the administration with recommendations to ensure successful administrative systems - distributed or otherwise. After only a few weeks, a number of issues had surfaced that needed to be addressed by this "independent" function. A mission statement,

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[6]Personal communication, Clark Pallen, Campus-wide Data Administrator, Wisconsin/Stevens Point, November 8, 1990.

[7]"Administrative Systems Review Committee - Final Report," Administrative Systems Review Committee, Virginia Tech, June 7, 1989.

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as well as supporting statements, were presented and approved by the administration. The mission statement reflects an initiative to ensure that information technology is supporting the administrative functions at Virginia Tech:

> Ensure that automated administrative systems adequately support the fulfillment of the University's mission and the attainment of its goals and objectives, and that strategic initiatives in administrative areas are within defined guidelines and directions.

Strange as it may seem, this new administrative systems planning function is part of a management services operation within the department of Internal Auditing. Several "political" reasons placed it within this organizational structure, but it was primarily due to the fact that no one wanted to accept responsibility for coordinating distributed activities. The arrangement has worked out reasonably well, but any such planning or coordinating function should eventually be more strategically placed within the organization.

Efforts and Actions

Virginia Tech is fortunate to have a history of successful administrative systems. Many of the systems installed today incorporate advanced technologies in their operations and are regarded as more than adequate systems. However, the system and its usefulness may be seen in a different perspective outside the operational office. Deficiencies in administrative systems and the knowledge of distributed activities provided sufficient information to begin defining initial tasks for the administrative systems planning function. A strategic plan for administrative systems would be needed to provide a framework for future endeavors. More immediate tasks essential to developing a planning process and unified vision for administrative systems included the following: assessing current administrative systems and preparing a report, defining an acceptable operating environment for administrative systems, evaluating the need for standards, defining a comprehensive methodology for structuring operations in administrative systems (including cost justification), monitoring and assessing technological changes as they might apply to administrative functions, meeting with people throughout the university to promote the planning effort, and finally, serving as a focal point for issues relating to present and future administrative systems.

The assessment report was important and served as a working document for defining future initiatives, but the interesting outcome of these initial efforts was meeting with the people and learning what they thought about their responsibilities and future directions for administrative systems. Unfortunately, most people think in a vacuum! Planning has been in a reactive mode, which contributes to ineffectiveness and exposures to risk. These administrative offices and support staffs do little to promote the sharing of ideas, data, initiatives, or resources. Each group decides its priorities and proceeds with development and implementation. Projects are often directed at the immediate

needs of individual offices and the institutional impacts are not fully assessed. Consequently, much effort is presently going into promoting a sense of cooperation and teamwork with these areas and individuals, and emphasizing the need for considering change. Dr. Richard Nolan emphasized at the CAUSE 1989 national conference that it is important to view change as a transformation, that is, a destruction of the old and the simultaneous rebuilding of the new.[8] Educating people about change can greatly enhance the opportunities available through technology.

Interest groups, rather than formal committees, have been organized for some of the other initial efforts. An interest group on a comprehensive methodology now meets regularly to discuss needs and define content. In addition, some contact has been made with other institutions in the state in an effort to determine if cooperative projects may be feasible. At the present time, two planning phases have been defined for the methodology at Virginia Tech and both are being used in test situations. Some activity is also beginning with Information Resource Management and Institutional Research concerning standards for administrative data.

A draft of the strategic plan for administrative systems is being reviewed for a projected completion date of January, 1991. The plan will recognize and communicate the future directions for administrative systems at Virginia Tech. It can be used as a framework to develop other strategic, tactical, and operational plans.

Recommendations for Change

Initial efforts by Administrative Systems Planning recently culminated in a report to the Executive Vice President and Chief Business Officer. An extensive list of active and potential projects was defined; strategic initiatives that relate to and would improve administrative systems were identified; and recommendations were presented for changes in organization, as well as policies and procedures.[9] Organizational change and evaluation of policies and procedures relate most directly to improving the environment of distributed activities and are described below.

The report states that a distributed environment without central coordination is not the most efficient or effective organization for administrative systems. Such a structure creates "isolated" areas that often function in a vacuum and contributes to duplication of systems, data, processes, and so on. The specific steps to improve the organizational support for administrative systems at Virginia Tech include the following.

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[8]Richard L. Nolan, "Transformation of Information Technology in the Modern Higher Education Institution," general session address at CAUSE89, San Diego, California, November, 1989.

[9]"Administrative Systems Project and Organization Report," Administrative Systems Planning, Virginia Tech, September 24, 1990.

Identify an office that will be responsible for overall administrative systems and establish a matrix type organization for the distributed support staffs.

Emphasize the responsibilities for distributed support staffs, evaluate personnel assignments, and create a central resource pool.

Utilize the central Systems Development staff for new and enhanced administrative projects.

Implement a University Data Base concept with Institutional Research.[10]

These recommendations are currently being reviewed by the senior administrative staff. All these recommendations can be accomplished with existing resources and in a reasonable time frame.

The report also recommends that certain supporting policies and procedures should be in place as improvements are made in the organizational support for administrative systems. Some recommendations are the following.

Approve the pending policy for developing and implementing administrative systems[11] and clearly state that the policy will be followed.

Recognize an Administrative Systems Advisory Committee that will review items of importance for administrative systems, provide advice and recommendations, and approve certain actions.

Approve an efficient and effective procedure for assigning resources to projects based on acceptable criteria.

Stress the importance of standards and support efforts to define and implement guidelines.

Recommend the review of existing policies and procedures that might hinder automated administrative systems from responding effectively to management and user needs.

The current unstable organization of administrative systems and budgetary constraints at Virginia Tech are necessitating change. Implementation of these

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[10]"An Information Infrastructure For The Future," a report by Data Administration, Virginia Tech, April 14, 1988, p. 10.

[11]This pending policy states that all new and enhanced projects will be reviewed by a central office, and, if approved, assigned a priority for the allocation of resources.

recommendations will coordinate distributed activities, provide a significantly more efficient operation, and better utilize existing resources.

Conclusion

The distributed technologies that will prevail in the 1990s will certainly provide challenges and opportunities. The experiences and recommendations presented in this discussion should help prepare some institutions for imminent changes. Coordination of distributed activities will be more vital than ever before, however, coordination should also become an easier task. Advances in technology will decrease the concern about hardware categories; universal standards will enhance the connectivity of diverse systems; and administrative applications will actually gravitate to the system that best supports them. The major concern may then be in providing an integrated, seamless, open and, yet secure, environment. Integration, rather than innovation, might be the theme for the 1990s.

Contiguous Information Systems at the University of Hartford

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ABSTRACT

The main objectives of this strategy were to leverage the investment in the University's administrative information systems and data bases by creating an environment in which the central and departmental resources can together accomplish end user informational objectives while maintaining informational hygiene. Users in departments utilize the central capabilities and data to create and maintain functional and service extensions - "contiguous systems".

An evolutionary approach was selected to monitor progress and expand the capabilities and access as success warranted. Important influences for this approach were the University environment, small information system staff, expanding campus network, proliferation of computer technology on campus, and demand for application development.

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Background on the University of Hartford
The University of Hartford is an independent, comprehensive university, which provides educational programs in the liberal arts and professional disciplines for undergraduate and graduate majors. There are 105 undergraduate majors and 50 graduate degree programs offered by the University. Most of the more than 4,300 full-time undergraduate students come from the northeastern part of the United States. In addition to the full-time undergraduate students, there are over 7,000 others who enroll at the University during the year.

The University is located on a 265 acre campus in the greater Hartford area and has practically all of its facilities - colleges, dormitories and administrative buildings - located here.

Administrative Systems - Background
For over six years, the University of Hartford has invested in a portfolio of advanced, integrated administrative information systems. This strategic project was accomplished with one software vendor - Systems and Computer Technology (SCT). The original systems are student accounts receivable (ARIS - integrated with ISIS), human resource and payroll system (HRIS), financial information system (IFIS), and student information system (ISIS), which is by far the largest of all the systems. In 1989, a fifth system was placed in production - the alumni development and donor system (ADDS), which is also from SCT. The present portfolio of administrative information systems along with a brief description of each system is given in Table 1.

It is important to note that these five application systems are not stagnant. Major enhancements and, in some cases, total application system upgrades have expanded the functionality and capabilities of the systems. In fact, protecting the investment by keeping these systems updated has been a driving force in the application systems strategy. Not only are the latest enhancements from the vendor installed but in many cases the University has worked together with the software vendor, SCT, to be the user testing site for system enhancements before their general release. Furthermore, there have been a number of important subsystems that were developed in-house, because the University considered them strategic and time critical.

The growth of the systems can be indicated by a few quantifiable measures shown in Table 2. This Table displays the dramatic increase in all categories except one - namely, the number of the central applications staff. The increase for application support requirements and a continuing demand by end users gave impetus to end user computing and the class of programs that I have termed "contiguous information systems."

Another important factor has been the expansion of the infrastructure at the University to include a campus network that now includes all administrative systems users. The number of end users with privilege to access the production on-line administrative systems has more than doubled to 400 over the past few years. As should be expected, the original base of operational, supervisory, and managerial users has expanded to include more occasional users. The increased level of access and use of the administrative systems and data has been a factor in the demand for administrative information, enhanced system functionality, and enhanced system output.

Contiguous Information Systems - Definition & Objectives
End user computing, client/server architecture, distributed computing, and many other descriptions and definitions have entered into common usage. While each of these describe interesting and advance concepts, the particular thrust of the phase "contiguous information systems" that I wish to discuss in this presentation describes a class of programs and systems that are, in some manner, obvious or reasonable extensions of the central administrative systems. The extensions can be functional and/or service extensions. Systems such as a specialized theater and sports ticketing systems, ad hoc activities, and isolated PC applications are not within this definition. While where the data is processed or who actually has operational responsibilities is not a criteria for inclusion or exclusion, it will be noted that the trend has been to process more and more in the user environment. Another criteria for contiguous information systems is that the user has developed a major part of the program or procedure and exercises significant control on a production aspect of the contiguous system.

The contiguous information systems could have been entirely developed and controlled by the central information systems group. Indeed, some of the functionally contiguous systems had been requested by various departments for development; however, the institutional priority for these requests had been placed in a lower position in the queue than the department thought appropriate. In some cases, some of the functionality of a contiguous program will be absorbed into an expanded central information system in the future.

From the perspective of the institution as a whole, the responsibility of enhancing and ensuring the smooth operation of the administrative information systems is a prime consideration for the information systems group. This creates the usual conflict of demand for a limited development resource. In this case, it means that the demand for application systems development exceeds the limited resource of the application staff. This common situation, as well as the benefits of leveraging the institutional investment in the advanced administrative systems, was recognized as an opportunity to expand end user involvement in meeting some of their informational needs.

There are many objectives for contiguous information systems and some of these have been mentioned before. The main objectives are the following.

Contiguous Information Systems - Main Objectives

* Leverage the investment in the administrative information systems.

* Maintain the security, integrity, and availability of the administrative information systems and their data bases, while allowing end users to satisfy some of their informational needs.

* Decrease the application backlog.

* Provide consulting by application staff for start-up efforts of departments, while providing decreased continuing support as end users became proficient.

* Take advantage of the new infrastructure in networks and user orientated mainframe products.

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In summary, the above objectives can be thought of as maintaining central "informational hygiene," while giving end users tools, support, and opportunities to satisfy some of their simpler informational needs.

Informational Hygiene
The term "informational hygiene" can be thought of as the conditions and/or practices conductive to the well-being of information systems and data. These are the myriad of conditions and practices that are well-known to professional information systems personnel but are, in many cases, less appreciated by typical end users. Analogous to the term "hygiene" in the medical field, informational hygiene is a collection of conditions and practices that are not exciting but very are important. Informational hygiene is time consuming and requires constant attention and discipline to achieve its results in the information field. Some of the more well-known results are data bases that are of high quality, have high integrity, and are secure; high quality applications that have been thoroughly tested, documented, and created to be accurate, reliable, recoverable, and easily maintained; and highly reliable computer operations with up-to-date back-up and recovery procedures.

For the information systems group, informational hygiene denotes policies, procedures, and standards for all aspects of information systems activities - system development and maintenance, computer system operations, quality control, and operating systems - as well as separation of duties and audit trails for standard procedures. Informational hygiene is particularly important for systems that are or will become operationally embedded in the institution's activities.

To maintain informational hygiene of the central administrative information systems, only authorized end users may have read-only access to the administrative data base using exclusively the mainframe software supplied and maintained by the information systems department. All changes to the administrative data from any contiguous information system must go through the same editing programs that would be appropriate for similar changes done the usual way. In other words, while informational hygiene at the users level may be as good as with the information systems group, this can not be assumed; therefore, strict controls are enforced to protect the integrity of the institutional systems and data base.

Although the end user may achieve the same level of information hygiene, they are not encouraged to attempt the more complex, higher risk operational applications appropriate for the information systems department. While importance to the institution is a factor for deciding upon who should be responsible for the development of a particular system, other technical factors are also important considerations. Typically, the higher risk projects are the larger, more technologically advanced applications for which the inherent structure is low. In a similar train of thought, applications that are to become integral to the operational aspects of an organization need careful review as to which group should be responsible for the long term. For example, it can be noted that although decision support and executive information systems are important, they do not present the level of criticality that complex operationally embedded systems do.

With this understanding, it is clear that such contiguous systems should not compromise the standard practices and procedures of the information systems group or impact the production on-line and batch administrative information systems. To fully appreciate the implications and

impact of contiguous information programs and systems for the established administrative systems, an evolutionary strategy was selected and is discussed next.

Evolutionary Approach
An evolutionary approach was adopted as the best way to achieve our objectives without compromising informational hygiene. Contiguous systems applications were to expand as experience with less ambitious projects proved successful. Past experience has shown that this has demonstrated to be a effective approach. Not only was there a conscious policy of evolution, but there were also other factors that have paced the development of contiguous systems. The most important factors have been the absorption of information technology and the expansion of the campus network.

When some of the administrative systems were first installed in the early 1980s at the University of Hartford, personal computers and networks were still relatively new for many institutions. As the technology has diffused across the entire organization, opportunities for end users to satisfy part of their own institutional needs blossomed. Today the institutional network has expanded around campus and provides a capability for more advanced contiguous information systems.

End User Support
Early in the evolutionary process, it became apparent that technical ands consulting support of end users was a critical factor. Beyond providing the tools, infrastructure, and training, there were two important areas - the use of tools and infrastructure and the understanding of the meaning of the data in the administrative data bases. In the first area, many end users become proficient, while others who are not technically inclined continue to require support. The latter area of administrative data bases brings into focus the difficulty of presenting a complex data base structure that is not only designed for efficient operation but also much larger than the experience of even the most technical end user.

It is a well-known difficulty of presenting the data in a form and manner that is easily understood and accessible by less technical personnel. There are many ways to help resolve this issue; such as sophisticated data dictionaries and mainframe decision support software with its own form of the administrative data base (a static copy updated periodically). At this time, there is no consensus that the substantial institutional resources for such an effort should be allocated for that purpose. Most of the end users eventually identify the data elements that they need. However, enhancements and modifications to the administrative systems and the shifting environment of the end user have continued the demand for information systems support in this area.

Evolutionary Contiguous Information Systems - Examples
As discussed above, contiguous information systems have been evolving since major components of the administrative information systems were installed. The following examples are arranged in a roughly chronological order, which is also an order of increasing complexity. To help illustrate some of the relationships, a simplified network layout is presented in Figure 1.

Downloads of Extracted Data and PC Processing
The first examples were systems where data extraction and download programs were developed and put into production for the mainframe administrative systems. The extracted data was put

on movable media for sending by "sneaker net" to the end user's personal computer. Further analysis, summarization, sorting, and reports were done by the end user with standard personal computer software, e.g., spread sheets, data base, graphics program, statistical analysis, and word processing. In these cases, the end user could vary the data that was extracted within specified parameters and could initiate the process. Examples include decision support systems and financial analysis reports.

Mainframe Software and Files

Later, mainframe facilities (e.g., SPECTRA from CINCOM Systems and Easytrieve) for end user computing were installed for the administration information system. Although these facilities were designed primarily for ad hoc reports, they also are used to extract and store data on the mainframe data files. Mainframe reports can then be generated from these user created data files or the administrative data base or both. One of the key capabilities is the on-line feature that has appeal to departments that need a fast response to meet their daily operational needs.

The Bursars Department has developed over 100 SPECTRA programs ("processes"). About 70% of these would fall into the contiguous information category, since they are used for verification and reconciliation of departmental operations. Some of the programs are run daily to extract data from the administrative systems data base and subsequently store this data in the users' personal mainframe data files for later processing.

Network Usage and File Server

With the advent of the network (DECnet) in a number of end user departments, the previously mentioned mainframe software was utilized to access the administrative data base to create mainframe files that users directed to be moved to any node on the network and then converted for use by their personal computer standard software. End users have the option of moving the data files to the network file server or to their own data disks on their personal computer. The "virtual disk" feature of the network allows the personal computers of users to access data on the file server as if it were an attached disk dive (e.g., disk drive H:). The end user can grant access to these virtual disks for the sharing of data files.

Our Financial Affairs Department has effectively utilized these features for data concerning budget preparation, program ledger, general ledger, subsidiary ledger, and vendors. The personal computer software includes spread sheet and data base management programs. In addition to analysis reports, the data is also employed to aid in their department's management of the data on the administrative financial system. They have used word processing programs to produce letters with administrative data on their personal computer printers; these letters are created when the secondary merge data (e.g., vendor addresses) on a virtual drive is merged with a "shell" or primary document on their personal computer.

It should be recalled that my definition of a contiguous information system also incudes services performed by the end users to satisfy their own needs. An example of this occurrence is the situation where there was a user requirement for correspondence-quality printed envelopes, which was a service not (and is not now) provided by computer operations. These envelopes are for the correspondence-quality, personalized letters having "digitized" signatures on departmental stationary, which is the output of a production job executed by computer services operations. As in the previous example for Financial Affairs, an extracted file of addresses is moved to a virtual disk and the end users themselves produce the addressed

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envelopes with a word processor and correspondence printer. Due to the high volume of letters, it was necessary to have a production job developed by the information systems group to produce the letters and the address file in order to synchronize the order for later envelope stuffing. Total volume from a number of such jobs now exceeds 200,000 letters per year. A number of departments (e.g., Admissions and Alumni Development) have found this method to be an effective way to achieve their important objective of presenting the best quality of communication to their target audiences of prospective students and donors.

The Alumni Department has other systems of interest that fall into the contiguous category. One example is a production job extract that periodically moves financial information to the file server, where periodic reports and analyses are created by the end user employing data base programs, spreadsheet programs, and word processors. It is also interesting to note another benefit that end users now enjoy. End users can now "dress up" reports and presentations to important audiences with their personal computer software and advanced laser printers.

Mainframe and Personal Computer Processing

The examples above have emphasized the extraction of data from the administrative data base and the end user manipulating the data to produce periodic reports, analyses, or operational reports or providing services not available at computer operations. While the previous examples have some "feed back" of data changes (some of which are very important) to the administrative systems, there was little application logic that initiates a high volume of production changes to the data base. The next application provides an example of this type.

Our residential student housing department had the pressing need for enhancements to the administrative system. This need was in part due to the large number of new residences being completed and to satisfy student life style preferences in the process of assigning rooms, while at the same time meeting the institutional fee structures and policies. Although there was an enhancement under development for the housing module in the administrative system, the increased burden and time constraints had to be addressed. Room assignment information was the basis for assessing certain fees in the student administrative system and this assessment process had a time window that must be met for the billing cycle.

To meet these objectives and requirements, this contiguous system was developed to first extract certain student biographic and academic information from the student administrative system. Next, this data was moved to the residential housing department for creating and updating records on their data base on their personal computer local area network. The room assignment/fee process was accomplished by a program, which the residential life developed utilizing a standard personal computer software product. Then, they extracted and prepared the housing records for processing by the administrative system.

The step of entering the records into the editing program can be accomplished in two ways. The first way is updating on-line with a personal computer product entering the data into the screen as if were being keyed by a person. From the administrative system view point, this method creates an on-line transaction that is not discernable from any other on-line transaction. The other way is to send a special file of these records, which is run by an administrative batch program that processes the records as if they were on-line transactions but in a batch mode. In either method, informational hygiene of the administrative data base is

maintained since these housing records are processed by the same editing routines that are regularly used for verification and updating the data base.

Evaluation of Current Status

There have been a number of departmental successes. Some of the more significant success factors for departments has been found to be an existing expertise in computers and software (PC and/or mainframe) and a high motivation to satisfy an informational need. While continuity in the department effort was (and is) a major concern, this has not been a problem to date.

The policies and procedures have been successful in maintaining the informational hygiene of the administrative information systems and their data base, but this has slowed the progress in the spread of contiguous information systems and use of the various end user tools. However, this slower progress has been accepted as unfortunate but necessary to achieve the objectives listed earlier.

Support of the end users has been more extensive and continues longer than was expected. Nevertheless, there has been a significant net gain in the decrease of the application backlog and increase in the satisfaction of end user needs.

Concluding Remarks

This presentation has focused on a subset of end user computing that has grown over the past few years as information technology has advanced and has been absorbed in the end user organizations. The goal of informational hygiene will continue to have an information systems organization (centralized or decentralized) attempt to expand their systems to important operational and multi-departmental systems, while end users will continue to satisfy some of their own current and future informational needs. While the goals may conflict, the information systems group will be expected to be responsible for the higher risk projects either from the beginning or at a later time.

Since information technology will continue to advance for the foreseeable future, the feasibility for more contiguous systems will also expand. It should also be noted that the ability of end users to respond more quickly to changes and new demands in their own informational environment is a growing phenomenon that also provides an impetus to expanding the domain of end user computing in general and contiguous systems in particular. As the increased ability to accomplish informational tasks has become known, there has also been an increased expectation of performance that reinforces the impetus for end user computing.

As changes happen with the administrative systems, the impact of these changes will spread out to the end user, who will have to maintain the compatibility of their systems. It will be a challenge to continue to coordinate the contiguous information systems as changes occur in the administrative systems. For the future, there will be continuing expansion and shifting boundaries between the domains of the end user and the information systems group; it is this process and its tensions that needs to be understood and carefully managed to ensure institutional standards and objectives.

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Table # 1 - Administrative Information Systems Portfolio		
System Name	Installed / Major Upgrade	Summary Description
ADDS Alumni Donor and Development System	3/1989	Constituent and Solicitor Organization Modules, Pledges, Campaigns, Gift & Pledge Payments, Matching Gifts, Designations, Clubs & Associations, Alumni Support
ARIS Accounts Receivable Information System	2/1984	Accounts receivable for student system (ISIS)
HRIS Human Resource Information System	3/1987	Payroll, Personnel, & Position Control; Applicant Tracking, Payroll, Pay History, Benefits Administration, Human Resources Information, Government Regulatory Requirements
IFIS Integrated Financial Information System	12/1990*	Fund Accounting, Grant Accounting*, Budget Preparation, Purchasing & Procurement*, Miscellaneous Account Receivable, Cost Accounting, Fixed Assets
ISIS Integrated Student Information System	2/1984	Prospective Student Information, Admissions, Advising, Financial Aid, Registration, Housing/Room Scheduling*, Course Catalog, Class Schedule, Assessment, Grading, Faculty Load*, Academic History/Transcript

Table # 2 - Growth in Administrative Information Systems		
Number of:	1986	1990 Est.*
Source Code Modules	1,200	2,500
On-line Screens	182	368
Batch Jobs	N/A	760
Data Base Records	5 million	11.7 million
Application Staff	8	9

NOTE: (*) In process of implementation or upgrade.

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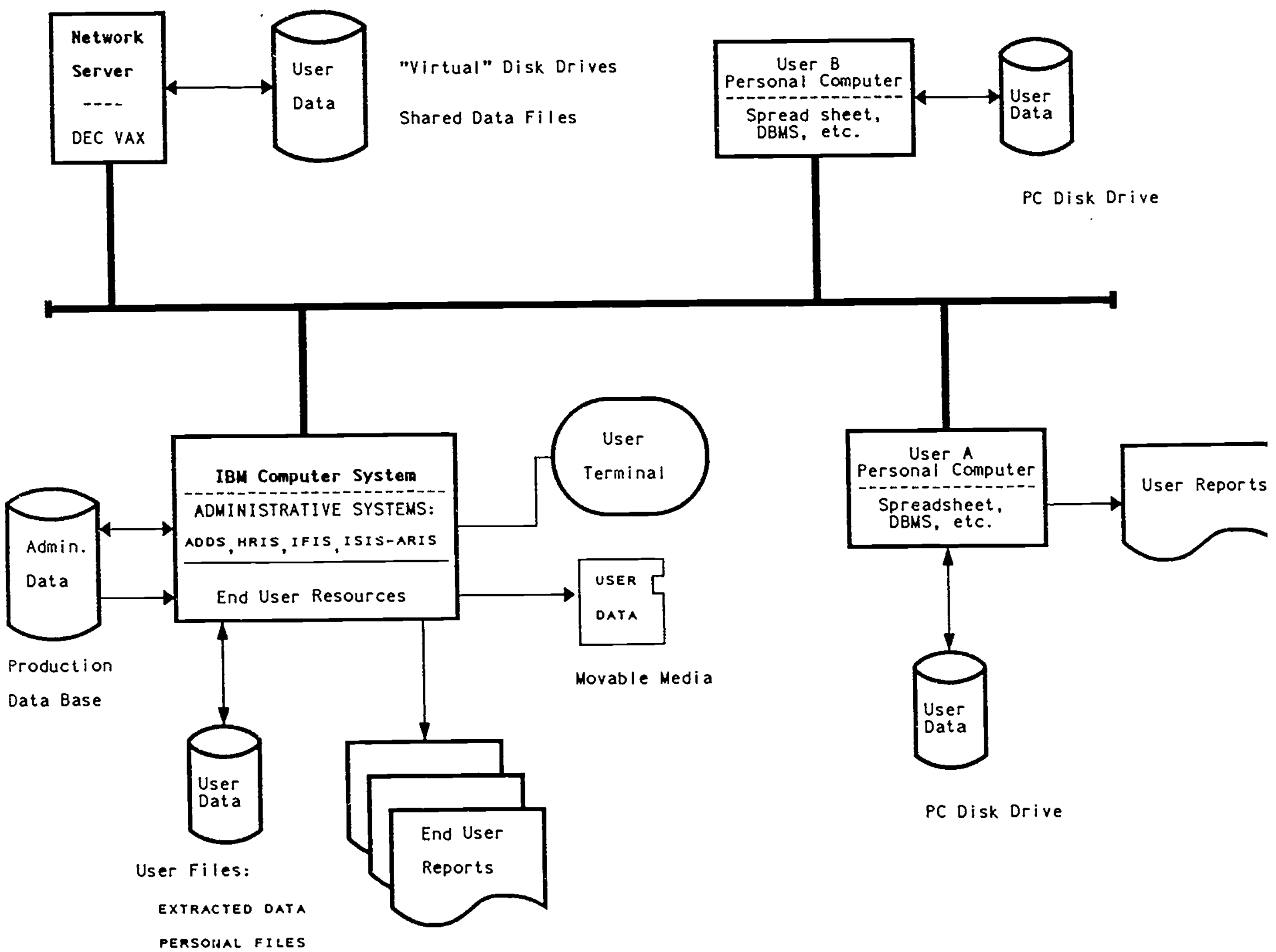
University of Hartford - Figure # 1

Simplified Network Diagram



Campus-wide RDBMS: A Search for Partnerships

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Abstract

The University of Pennsylvania recently signed a five-year, campus-wide partnership agreement with Ingres Corporation (now the Ingres Division of ASK Computer Systems) for relational database management system (RDBMS) software, support, training, and consulting. In this panel, we report on our experiences in choosing a relational database partner and negotiating a fruitful campus-wide license and support agreement. We outline the disparate needs that led us into and through the process, and we report on the initial database projects in three areas. Finally, we observe that the internal partnerships that emerged in the process will serve the University at least as well as the partnership with Ingres.

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Introduction

Virtually every university seeks to improve school and departmental management, reporting, and data analysis capabilities. Limitations of mainframe-based information systems lead sub-units to explore minicomputer-, workstation-, and pc-based solutions. Independent applications development carries risks, however, such as software incompatibility and loss of data integrity.

In recent years relational database management systems (RDBMS) have been hailed as the best platform for building flexible applications supporting ad hoc query and data sharing, even if they do not yet deliver the most cost-effective transaction processing. Moreover some leading RDBMS software vendors claim to be able to integrate applications across multiple host and desktop platforms, even (in some cases) if applications were built with a competitor's RDBMS. Thus institution-wide use of RDBMS technology holds great promise for solving sub-unit information systems problems.

A key question is whether compatibility with the emerging industry-standard Structured Query Language (SQL) is sufficient to assure integration across multiple software platforms. If so, schools and administrative units could be allowed to make their own best deals with RDBMS vendors (and applications software vendors using RDBMS) in the context of their own hardware strategies.

At the University of Pennsylvania, we adopted the opposite strategy: seeking the best possible partnership with one RDBMS vendor for mid-range and desktop platforms. (Our mainframe database strategy is still under study). Our reasons were threefold: (1) we judged that SQL is not yet a sufficiently robust standard, since most leading vendors vigorously advertise proprietary enhancements; (2) we learned from other universities about the formidable effort required to support even one RDBMS; and (3) we observed how costly the "best deal" would be for one or two sub-units negotiating alone.

In May 1990 we sent a Request for Partnership (RFP) to four leading vendors of RDBMS software and support services. A campus-wide committee evaluated the proposals and judged that Ingres Corporation had the most responsive combination of state-of-the-art software for VAX, UNIX, and desktop hardware; support, training, and consulting programs; and commitment to a partnership that would make the University of Pennsylvania a showcase for RDBMS technology in administration, research, and instruction. After a month of negotiation with Ingres representatives, we signed a five-year partnership agreement on June 29, 1990.

Two units, Development Information Systems and the Wharton School, played major roles in the RDBMS evaluation and negotiation processes, which were led by the central Office of Information Systems and Computing (ISC). A third unit, the School of Arts and Sciences, had priorities and pre-existing RDBMS software that provided important context. These three perspectives are described below, followed by the ISC viewpoint and some conclusions.

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Development and University Relations Perspective

The department of Development and University Relations is the University's primary "interface" to the external world. It provides the principal means of contact for Penn's alumni; it manages the University's public image and its relations with outside organizations; and it solicits voluntary contributions from alumni and other private sources in support of the University's academic and research programs. The department's 200 fundraising staff are distributed among the University's twelve schools, six resource centers, and eight central offices, all supported by a central services organization.

Since information is a fundamental resource for institutional advancement, the success of an advancement program depends critically on the quality and accessibility of information. Our traditional information environment has been primarily IBM mainframe-based, comprising three separate, non-integrated systems developed to perform gift accounting, prospect tracking and management, and prospect bio-demographic inquiry and maintenance.

In October 1989, the University officially kicked off a five-year capital fundraising campaign. Our goal is to raise one billion dollars to ensure Penn's place in the front rank of the nation's universities. Over 550 million dollars has been raised so far, including a record-setting 140 million in the past year.

The Campaign for Penn became, in many ways, a "critical incident" for the University. In planning for this extraordinary fundraising effort we became increasingly aware of the crucial role that information would play. At the same time we began to recognize the inadequacies of existing information resources.

Development Information Systems faced three major problems. Our ability to produce reports (6,500 last year with growth projected at 15-20 per cent) from the three databases was too limited. Even as the biggest user of the central IBM 3090, Development was subject to the resource constraints that sharing a central computer entails—our needs far exceeded our capacity. In addition, the existing fundraising applications were primarily transaction-oriented; their design caused complex queries to be processed inefficiently. And, our minimally-skilled programmers needed to understand file design and access strategy tradeoffs to reduce report turnaround times.

Second, we needed to develop a departmental capability to design and implement new fundraising applications. Fundraising, a dynamic enterprise, puts extraordinary demands on its information resource base. Further, the existing constellation of applications required signing on to all three systems in the course of investigating a single prospect's record.

Third, we found ourselves, in the central Development office, under increasing pressure from schools to decentralize information resources and to move toward more school-based control of data. Failure to address this issue might result in sub-optimal decision-making by school offices, which would compromise overall data integrity.

Our solution was to integrate the three major fundraising applications into one, thus providing a single-system image. Screens would be re-designed for better access, creating a pc-like interface, with pull-down menus and customizable user views. Development Information Systems staff would design this system on a separate department-based minicomputer to improve our ad hoc reporting environment by separating query processing on the mini from transaction processing, which would stay on the mainframe. We would also create an easy-to-

use report generator, so our front-line fundraisers themselves could get answers according to their schedules, not ours.

A relational database management software product was determined to be ideal for our needs. We also understood that with the needs of the capital campaign behind our arguments, we were in good position to win University approval of our proposal.

Over several months we investigated Ingres, Oracle, and Sybase as candidate RDBMS. Our technical selection criteria were stringent. We needed:

• A robust set of application development tools to enable easy application generation by our departmental technical staff

• Query optimization within the database software, so our programmers need not understand and select optimal file access paths

• The capability to implement "business rules" in the database server, so that they would be accessible by any applications we might develop

• Industry-standard SQL, for data access and manipulation

• The capacity to develop distributed applications over time, so that more technically advanced schools could assume greater responsibility for maintaining their own information.

Ingres was our first choice, based on an evaluation of technical specifications. We then arranged to perform an on-site evaluation of the Ingres software along with the UNIX-based minicomputer we were planning to obtain from Sequent Computer Corporation. The joint evaluation (with both vendors participating fully) was completed in ninety days last spring.

At the time we began to negotiate with Ingres, the Wharton School was beginning its own negotiations with RDBMS vendors. Development and Wharton decided to combine efforts in order to provide a unified bargaining position. Our activity generated interest at Penn in a University-wide site license.

The resulting Penn-Ingres partnership has provided several benefits to the Development department. We acquired the Ingres software at only one-third our projected cost. We now have the promise of central campus support of Ingres. The central IS office on campus is vigorously marketing Ingres internally to other departments, thus enlarging the user base. And, the cooperative links forged during the Ingres partnership negotiations are serving us well in other areas of information resource management at the University.

The Wharton School Perspective

The Wharton School of the University of Pennsylvania has over 5,000 students. In addition to 1,500 MBA and 300 Ph.D. candidates, Wharton enrolls 3,000 students in undergraduate day and evening programs plus 200 in an Executive MBA program.

Information technology has become integral to the mission and operation of the School at all levels. Wharton Computing historically has been charged with academic computing, and the School developed its own internal academic computing center during the early seventies. Over the past five years the responsibilities of the computer center changed in response to pressures

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from administrative units to develop support for their users' needs. In the highly decentralized environment of the University of Pennsylvania, central university information systems were not able to support much more than the lowest common denominator, so the additional needs of professional schools, such as Wharton, were addressed only minimally.

The personal computer revolution has allowed Wharton departments to develop specialized applications to fill gaps in University systems. Over time these pc applications have proliferated to the point of becoming unmanageable. Often departments have used part-time student workers to develop their applications. When a new crew of students arrives, systems often have to be revamped, because of lack of documentation. Thus a School-wide database strategy has become an essential component of our response to the escalation of user demands.

Wharton's strategic planning process is the central force driving our RDBMS partnership. Strategic planning has been an annual School-wide process for more than five years, emphasizing planning for management of technological change. For example, one of our strategic goals is to provide information systems that respond directly to the needs and goals of the Wharton School without redundancy with central University systems. The solution is the selection of an information architecture for development of academic and administrative applications, a tactical approach linked directly to departmental goals across the School. Our underlying methodology is evolutionary, rather than revolutionary.

Wharton Computing had initiated an unsuccessful RDBMS selection process two years earlier. What is different today? The tactical solutions in progress today are in response to user demands tied directly to major business goals of the Wharton School. In retrospect, our earlier efforts anticipated user demand by about one year; thus, the School was not ready to respond with an institutional commitment of direction and additional funding. Today, our tactical solutions are compatible with the internal and external culture of the institution. Internally, there is an awareness of the mission-critical information needs across the senior management level of the School and in our top-level advisory committees. Externally, we have received support from the University's central office of Information Systems and Computing toward collective solutions that support our distributed computing environment.

Wharton needed an RDBMS platform primarily to support applications development for two mission-critical projects, Graduate Admissions and External Affairs' Alumni Development Information Systems. These two ends of the student life cycle were in need of immediate solutions; between them other student information needs were waiting impatiently.

The RDBMS becomes the integrator for new development combined with available packaged solutions. Departments throughout the School are in need of an infrastructure to integrate central administrative data, School-wide data, and department-specific data; to manage their data; and to support ad hoc queries and routine reporting requirements. Departmental pc solutions are showing signs of collapsing under their own weight and are in need of computer professional expertise and an information architecture to continue growing. These support structures are being implemented, our staff has been deployed in many departments, including the Graduate Admissions and External Affairs offices, and our RDBMS strategy is key to the technology support structure being built.

Our RDBMS selection was based on the following primary criteria for an information architecture to support long-term information systems development and integration:

• The RDBMS should be highly portable. Wharton required support for multiple platforms, primarily VAX VMS and ULTRIX, Berkeley and System V UNIX.

•The RDBMS should support access to data residing at many levels of the organization. We required both distributed databases and distributed processing.

• The RDBMS should improve development productivity and computing support. We required efficient end-user tools, including a low-end report generator and SQL, and efficient programmer tools.

• The RDBMS should be affordable. Wharton required a cost-effective solution for our central VAX and for various departmental systems, from microVAXes to Intel 80386-based systems.

Our RDBMS efforts have furthered the goals of the School. Moreover, internal partnerships have been developed and strengthened. Development and Wharton recognized the commonality of our directions and established an alliance to improve our position with the vendors. That we were able to find a partnership with the central University administration was an exceptional opportunity to build bridges connecting our frequently autonomous worlds.

Fostering and promoting the partnerships developed through this selection process is key to successful and extensive exploitation of RDBMS technology. Through the Ingres partnership we have developed associations that can help us exploit the software to gain a competitive edge with this technology. When Ron Weissman, of NeXT, Inc., spoke at Penn recently, he characterized some universities' pursuing vendor donations to support computing as a "belief in Santa Claus." Indeed, many of us have seen the dismal result of gifts and grants with no supporting budget from our institutions, but we cannot afford not to believe in Santa Claus. We must plan around the opportunities that our vendor relationships create for our institutions.

Wharton gained from the central University partnership a more powerful representation at the negotiating table with Ingres; and furthermore, the significant, farsighted vision is that this is the beginning of campus-wide directions, perhaps even standards, for distributed information systems development at Penn. Our other Penn partnerships initially strengthened our bargaining position. Furthermore, the Penn partnerships open the door for a concerted effort to build on each other's successes and provide the structure to plan for contiguous systems.

Our current direction is to implement pilot projects that will foster an understanding of the total impact of this technology on our organization. The purpose of these pilot projects is not simply to see if the proposed solution works, but to address how well this technology will work within our environment. What are the costs, time, and effort required to install, migrate to, develop, and maintain systems using this RDBMS technology? How successful are these tools in achieving our strategic objectives? Our initial pilot is a project in Graduate Admissions that is moving us toward a School-wide student information database.

How well did this decision process work for us? Given the number of leading RDBMS vendors supporting VMS, there were many good solutions—only a non-decision could have been a bad decision. Other alternatives would have equipped Wharton with a technology to develop good applications, but our decision framework required us to balance cost, performance and technical quality, and time. We believe that the Ingres decision maximizes the benefits across these three factors. Furthermore, Ingres was the clear choice to optimize the strengths of the University working in partnerships, and we are now the proving ground for how well these partnerships can benefit each of the partners.

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The School of Arts and Sciences Perspective

The University of Pennsylvania is a decentralized institution, with the autonomy of the twelve schools enhanced by responsibility center budgeting. Many University functions are split, with basic services provided centrally and specialized services provided by the schools.

For example, the School of Arts and Sciences is responsible for its own strategic planning and institutional research. Within the Arts and Sciences Dean's Office, a staff of six share responsibility for School-wide institutional research, planning, and administrative information systems. Ever since serious strategic planning began in Arts and Sciences in the early 1980's, the demand for information in support of long-range planning as well as day-to-day decision-making has grown rapidly. Planning and strategic management have become the responsibility of virtually every senior and mid-level manager in the School. Thus, associate deans, department chairs, and directors all request much more information.

In Arts and Sciences the crucial need for information to support planning drove the search for a relational database management system and for the formation of university partnerships to develop the comprehensive information query system we all needed. One recent event that made that system even more immediately necessary was the installation of a new University Student Records System (SRS). While that system has greatly improved the actual registration process and provides better information on-line about individual students and courses, it is optimized for individual transactions, not for ad hoc query. In addition, there was an enormous backlog of programs to be rewritten, and the programming languages analysts had used before (SAS and FOCUS) were not suitable for SRS' complex data structures. Finally, it was impossible to create the links between systems required for sophisticated institutional research.

During fall 1989 we began to realize that the only real solution to our difficulties would be the creation of a comprehensive, integrated, institutional research database. Our plan was to extract data from the various transactional systems and put it into a relational database with appropriate security, user access tools, support documentation, and personal consulting. Arts and Sciences technical staff analyzed our own resources, examined other possible options, and concluded that our only cost-effective option was to make use of existing School platforms: an IBM 3090/200, an IBM 4341, and SQL/DS, IBM's relational database management system for the VM/CMS operating system. Since the University at that time had no available platform or standard for relational databases, we decided to make use of the best systems available to us at the lowest cost.

Once we examined our platform options, we realized that we were considering design and development of a complex information database that could easily serve the entire University's needs as well as those of our School. Arts and Sciences thus made a proposal for joint School/University development of the Institutional Research Query Database (IRQDB). We made the proposal in January 1990, before the University had seriously considered entering into a institution-wide licensing agreement for RDBMS technology.

Proposing a University-wide rather than a School-specific project did, however, slow down the process for us. For example we had numerous discussions of possible hardware and software platforms. After lengthy negotiations, we ultimately resolved some of our difficulties. First, we realized that the platform decision could be postponed for at least six months without damaging the project. Second, as a campus-wide RDBMS strategy became increasingly viable, we agreed to remain flexible on the platform for IRQDB, if we could be involved in any University discussion of RDBMS.

In September 1990, our proposal was approved, and we are now in the planning phase of IRQDB. The RDBMS platform for the project must still be determined. One complication is that Ingres does not run on the IBM VM platforms owned by Arts and Sciences, although Ingres does provide a gateway to SQL/DS.

Has the School/University partnership regarding RDBMS and IRQDB been useful and rewarding? The process has been so slow that it is still too early for a final judgment. Is this an equal partnership? Not totally. From our perspective, when the central offices are in control to some degree, they feel comfortable and function fairly well. For example the driving forces for the purchase of RDBMS software were external to ISC, but ISC then took over and successfully managed the process in partnership with the separate schools and offices.

With IRQDB, the project manager is external to ISC. Some central staff apparently think they are not sufficiently controlling the process and and often act much less comfortable. We hope to modify those attitudes over time through cooperative behavior leading to successful projects.

Information Systems and Computing Perspective

The University of Pennsylvania, a private research university with a major teaching hospital and a $1.1 billion annual budget, is well-known for its "responsibility center" management style, whereby schools and centers are held accountable for meeting revenue and expense targets. In this milieu, central initiatives that increase indirect costs or reduce local autonomy are, predictably, resisted. Fortunately, there appear to be a growing number of decision makers at the University who understand the importance of an integrated information architecture, even if they are unclear what costs and tradeoffs will be required. Any new initiative, such as a campus-wide RDBMS partnership, must be understood in this context.

More specifically, the Ingres partnership can be seen as a direct result of the strategic planning process that ISC had carried out the previous year. Of the twelve objectives spelled out in the February 1990 "Strategic Directions" document, three are germane:

• Provide administrators with the information and systems needed to do their jobs. Design new systems and their underlying data structures from a University-wide perspective to promote integrated management of University resources.

• Facilitate, coordinate, and support the computing activities of schools, centers, libraries, and administrative offices.

• Establish an integrated, campus-wide architecture of selected hardware and software to enable cost-effective system development and data sharing among microcomputers, minicomputers, and mainframes.

A key strategy outlined in that document is partnerships, both internal and external. The proposal review committee was impressed by the partnership vision in the Ingres proposal, and we (ISC as well as the Schools) have been impressed with the first six months of Ingres' "service after the sale." A concern, however, is the fate of the Ingres technology, personnel, and higher education partnership commitment since the takeover by ASK Computer Systems last fall. We intend to visit ASK corporate headquarters soon to pursue these issues.

Internally, the partnerships established during the RFP and negotiation processes continue to serve the University well. For example, both Development and Wharton have donated host

resources for campus-wide training seminars, Development has provided resources on its Sequent for development by the central MIS group of its first Ingres application, and all three units are working with ISC on data modeling and CASE projects. Moreover, many observers report increased openness and trust between ISC and its client groups. Although we have by no means solved the problem of providing robust campus-wide support as Ingres usage proliferates, we are encouraged that a partnership solution can be found.

Conclusion

Creating a campus-wide strategy for RDBMS selection, application, and support is a formidable challenge, given the distributed responsibility for management and computing characteristic of research universities. Turbulence in the RDBMS marketplace exacerbates the problem. At the University of Pennsylvania, an internal partnership of schools, administrative units, and Information Systems and Computing has been created to address this challenge.

Despite the differing needs and priorities of the partners, we have found that motivation, leadership, and good will can lead to timely, joint decision making. In addition we have become convinced also that the commitment of vendors to long-term partnerships are as important as the power and cost of their products.

Acknowledgements

Our Ingres partners, notably Hugh Caplan, Don Graham, Jim Mullin, and Sheri Savin, have been consistently helpful and reliable, before—and after—the contract was signed; Penn colleagues, Ron Arenson, Francine Buchhalter and Jeanne Curtis played key roles in the negotiations. Noam Arzt is doing a fine job on the Penn staff in the new position of Ingres site coordinator, and numerous staff in the central Computing Resource Center, Data Communications and Computing Services, and University Management Information Systems departments are stepping up to the challenge of creating an Ingres support structure.

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CAUSE90
MIAMI BEACH
NOVEMBER 27-30, 1990

CORPORATE PARTICIPATION

Coordinator: E. Michael Staman, West Chester University

Participating in CAUSE90 were 47 corporations which offer solutions to higher education information technology. A list of these corporations appears on the next page, followed by descriptions of some of the products and services they offer, and their participation in this conference. Their offerings at CAUSE90 ranged from corporate presentations, workshops, and exhibits, to sponsorship of special conference activities and suite hospitality.

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PARTICIPATING CORPORATIONS

CAUSE appreciates the participation of the following corporations in CAUSE90:

American Management Systems (AMS)
Apple Computer, Inc.
AT&T
Business Systems Resources (BSR)
Ca[illegible]s America
Computer Management and Development Services (CMDS)
Coopers & Lybrand
Dataram
Data Research Associates
Datatel, Inc.
David Systems
Deloitte & Touche
Digital Equipment Corporation
EDS (Electronic Data Systems)
EDUTECH International
Ernst & Young
GKA (George Kaladis Associates)
Hewlett-Packard Company
Hitachi Data Systems (HDS)
IBM Corporation
Information and Communications, Inc. (IC)
Information Associates
Information Builders, Inc.

Integral
InterVoice
Iron-Soft, Ltd.
John Minter Associates
KPMG Peat Marwick
NCR Corporation
Novell
Oracle Corporation
Pansophic Systems, Inc.
PeopleSoft
Peripherals
Periphonics Corporation
Quodata
Sequent Computer Systems
SofTech Associates
Software AG of North America
Sterling Software
Storage Technology Corporation (StorageTek)
Sun MicroSystems, Inc.
Systems & Computer Technology Corporation (SCT)
The AIMS Group
The Robinson Group
Wang Laboratories
Xerox Corporation

American Management Systems, Inc.

Dr. Fred L. Forman, Executive Vice President and Chief Technology Officer of American Management Systems (AMS) delivered a talk on Wednesday, November 28 entitled "Making Those PC's Part of the Solution, Not Part of the Problem." This talk described a general approach, based on specific actual project experiences, as to ways to use the capabilities of PC's already in use in an organization as part of future distributed processing architectures.

After a very brief introduction to AMS and himself, Dr. Forman proceeded to discuss elements of the problem, elements of the solution, and a general framework called "network-based solutions."

Five general types of problems with current development and delivery technologies were discussed:

- Escalating costs for delivery and operations,
- Inability to integrate isolated applications,
- Systems that are hard to use,
- Systems that are not reliable, and
- Systems that are not responsible to changing user requirements.

Next, five specific projects were described which utilized networking and distributed intelligence to deliver applications which overcome some or all of the types of problems listed above:

- The development of an integrated wide area network for a major organization utilizing existing local area networks;

- The implementation of a user-friendly front-end (i.e., graphical user interface) to an existing production application;

- The development of an integrated front-end to enable business process restructuring for an insurance company;

- The development of a back-end atomic database fed by existing production applications to enable management reporting and decisionmaking for a major bank; and

- Downsizing by migrating a mainframe application to PC's running on connected local area networks.

Lastly, Dr. Forman discussed a generalized approach called network-based solutions: an information technology architecture used to solve business problems, in which data and processing are distributed across multiple platforms in the most effective manner. This discussion included:

- Describing the elements of a network-based solution;

- Describing what a network-based solution looks like and reviewing an example specifically for the college and university environment;

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- Discussing the objectives of network-based solutions;
- Describing some of the major risks of developing a network-based solution;
- Covering some of the considerations to help MIS determine whether network-based solutions might be appropriate; and, lastly,
- Indicating activities that MIS directors should be doing today to enable their organizations to be positioned to implement network-based solutions in the future.

Dr. Forman received a standing ovation from the overflow crowd upon completion of his talk.

APPLE COMPUTER, INC.

Apple Computer would like extend a warm thank you to everyone who participated at this year's CAUSE90 conference. We are pleased to have shared with you the many powerful information access and management solutions for the Macintosh that have been developed both by your colleagues and Apple Computer. We look forward to our continued partnership with CAUSE and its member schools and hope to see you again in Anaheim, California.

It was our pleasure to host the following activities at this year's conference:

- CAUSE90 Corporate Exhibit Area

Several university and college projects were demonstrated in Apple's booth including the University of Texas at Austin and MacNOTIS library access programs, campus information systems from Cornell, Dartmouth, and San Joaquin Delta Community College, and the alumni development system from Yale.

- Apple Workshops

Once again, Apple Computer offered two hands-on workshops for all attendees. The HyperCard hands-on workshop focused on how HyperCard can be used as an administrative tool—from acting as a front-end decision support tool to acting as a desktop organizer for all tasks.

The second workshop gave hands-on training with Apple's open, standard, SQL database tool—Data Access Language (DAL, formerly CL/1). Participants experienced DAL's plug-and-play connectivity—easily integrating strategic information from various host databases (in this case Ingress and Informix) into Macintosh applications.

- CAUSENet Messaging System:

The HyperCard-based CAUSENet messaging system was displayed on twenty Macintosh IIci kiosks in the Fontainebleau hotel and provided a variety of messaging and information services to CAUSE attendees. A new first for 1990 was providing attendees with access to mail on their own campus systems through the INTERNET. The directory section called the People Stack included color photos of attendees, while the Agenda and Miami sections provided timely and useful local information.

- Macintosh IIsi Raffle

Apple also raffled off two Macintosh IIsi computers at the Apple Exhibit. The two winners were Steve Mey, Associate Director, Systems Development, University of Illinois and Doug Levy, Manager, Systems and Programs, University of Michigan.

- Ask the Experts: ISDN - What to Expect from Industry

Norman Doyle from Apple Computer participated in this vendor panel discussion on ISDN and discussed Apple's hardware and software solutions for this technology.

- Throughout the conference, attendees were kept informed of activities and conference highlights through the Daily CHAT (CAUSE Has Apple Technology), a newsletter that was desktop published with a Macintosh IIci computer and LaserWriter IINT.

For additional information about Apple's products, programs, and solutions for higher education; contact your local Apple sales office or write to:

Bruce Stancombe
Manager, Administrative Computing
Apple Computer, Inc.
20330 Stevens Creek Blvd., MS: 36HE
Cupertino, CA 95014

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AT&T
Your Computing Systems and Networking Solutions Company

CAUSE90: Success Once Again

AT&T is pleased to have participated in the 1990 CAUSE Conference in Miami Beach, Florida and would like to thank all of the attendees who visited our booth. The conference provided an excellent opportunity to demonstrate hardware and software solutions for the education community and to reconfirm our commitment to higher education.

SCT "Banner"

The AT&T booth highlighted the SCT "Banner" administration software running on the powerful AT&T System 7000 hardware, in addition to showing Imaging technology as well as networking and connectivity through the use of AT&T StarLan/StarGroup products. Also, available in the booth was Homisco - a premier telemanagement agent for call administration solutions.

System 7000

The System 7000, running the Banner application, demonstrated student administrative services as well as a finance system, human resources and alumni development system. The power of the 7000 combined with the flexibility of Banner presented a major solution to administrative education problems.

Imaging

Imaging technology, demonstrating a high quality "OPEN" imaging system, was displayed using Imaging Architecture components. The Imaging Architecture has been designed to support occasional users and high volume users of image processing. The fax based system, takes advantage of the AT&T board technology which includes the integration of voice, fax, optical character recognition with the Imaging Processing System.

Networking

In the area of networking and connectivity, the StarLan/StarGroup products demonstrated the capability of turning a single room of independent workstations into a combination of low-cost and high performance tools. The StarLan 10 Network is designed to meet the most demanding data communications requirements of large organizations or those requiring high bandwidth capacity.

AT&T : The Right Choice

For more than 100 years, AT&T has brought information technology to customers' fingertips. The needs and demands of the education industry for improved communications technology have been heard and AT&T strives to provide viable solutions.

For more information about AT&T's Education Organization, call (201) 631-1161.

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BSR

The Advance System

Business Systems Resources (BSR) is a 15-year-old software services firm that specializes in alumni/development and fund-raising information systems. BSR was pleased to demonstrate **Advance**, an automated management and support system for Alumni and Development offices, at CAUSE '90. Additionally, BSR was pleased to donate $500.00 to the annual fund of the drawings winner.

BSR clients raised over $1 Billion in 1988-89 (over 10% of the total voluntary support for higher education in the U.S.) and have conducted or are conducting capital campaigns totaling over $8 Billion. Individual database sizes vary from a few thousand to over one half million people.

ADVANCE

Highlight of Features

Advance is a complete support system for college and university institutional advancement activities. It is a comprehensive tool to track and manage Biographic, Giving, Evaluation, and Prospect Cultivation data.

- **Advance** maintains comprehensive demographic profiles.
- **Advance** manages information about Alumni, Parents, Friends, Organizations, Foundations, etc., and the relationships among them. Relationships include such things as Student/Teacher, Parent/Child, Spouse, Former Spouse, Solicitor/Prospect, Staff/Volunteer, and any other you care to define. And, there is no limit to the number of relationships an entity can have with others.
- **Advance** provides detailed tracking of Prospect Segmentation, Cultivation, and Stewardship activities, including Ticklers that can be used for personal calendars or reminders.
- **Advance** automatically generates Gift Club data from gift and pledge, transactions based on site-specific criteria.
- **Advance** provides support for on-line Phonathon programs. Features include auto-dialing, on-line prospect profiles, and on-line management and monitoring of callers.
- **Advance** supports tracking and management of events.
- **Advance** has comprehensive support for Alumni Membership programs, including production of dues billings and receipts.
- **Advance** tracks anticipated matching gifts. It can automatically include a personalized reminder of a matching gift opportunity on the original gift receipt or acknowledgment.

BSR would be happy to answer questions, and provide additional product information. For a discussion of your advancement information needs or for an in-depth demonstration of **Advance**, please contact BSR at (617) 890-2105.

Business Systems Resources

Headquarters:
1000 Winter Street
Waltham
Massachusetts
02154
617 890 2105

Western Office:
200 N. Robertson Blvd.
Beverly Hills
California
90211
213 275 0109

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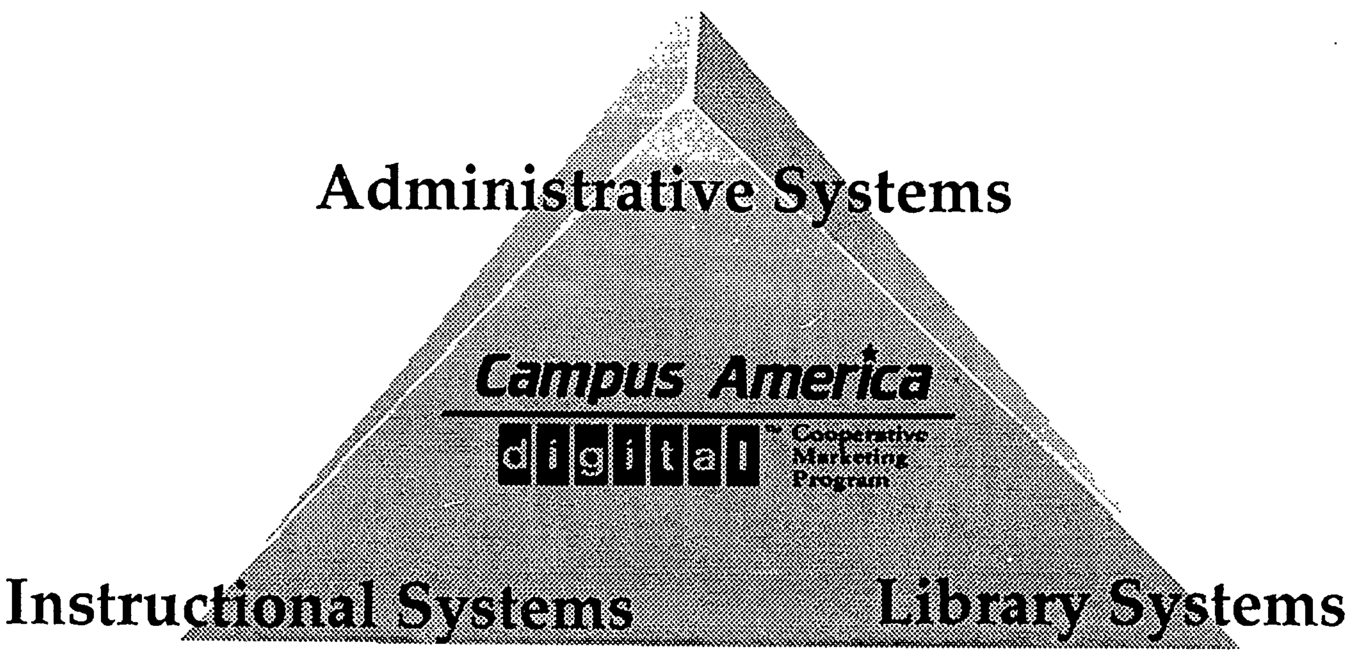
Campus America

Administrative and Instructional Systems for Education

Understanding the need for the integration of software and hardware systems campus-wide, Campus America announced its alignment with Digital Equipment Corporation to provide a triad of software products — POISE — administrative, instructional and library management systems, Wednesday, November 28 at CAUSE90. This alignment provides easy "one-stop" shopping for all institution management needs.



'Working Together with Digital' as was displayed on our visors, Campus America joined Digital representatives in welcoming all the participants of CAUSE90 to the BAHAMARAMA Reception, Tuesday evening.

The POISE Library Information System (LIS) was announced at CAUSE90. This comprehensive system includes a full MARC record system which runs on the VAX/VMS machine, search capabilities which uses Boolean logic and circulation bar code reading.

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The announcement of LMX (Learning Management Expert), a curriculum design automation tool, brought much attention to Campus America's showcase of products.

Campus America's executive office is located in Knoxville, Tennessee. Additional product centers are located in Roswell, New Mexico and Calgary, Alberta.

Continuing to support CAUSE and its efforts to be the major influence in the profession of information technology management in higher education has become one of Campus America's foremost goals. We enjoy the opportunity of sharing our triad of products and discussing our programs with the hundreds of convention attendees who stop by our booth each year.

Campus America

900 Hill Avenue, Suite 205
Knoxville, TN 37915-2523
(615) 523-9506

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IT TAKES A SOLID FOUNDATION TO KNOCK DOWN THE WALLS OF YOUR LIBRARY.

Visitors to the Data Research display at CAUSE found out how the solid foundation of the Data Research System for library automation allows them to reach beyond the physical constraints of their libraries and connect to vast new information resources.

A Solid Foundation For Academic Libraries

The Data Research System includes automation of all library functions, including critical academic-oriented modules such as Reserve Book Room, Journal Citation, and an Information Gateway that allows both connection to external databases and the ability to create local databases. Data Research also offers an integrated software module for keyword and Boolean searching on full-text databases, including an on-line encyclopaedia.

The Data Research System currently serves more than 100 academic libraries worldwide.

A Solid Digital Solution For Library Automation

Data Research is a participant in the Digital Equipment Corporation Cooperative Marketing Program. The Data Research System runs exclusively on hardware from Digital, the worldwide leader in networked computer systems.

A Solid Foundation in Standards

Data Research has long been an industry leader in developing and implementing a library automation system based on data processing and library standards. The Data Research System is built on the MARC (machine-readable cataloging) standard, and Data Research is currently at the forefront of development for resource-sharing based on the new Z39.50 standard for the networking of bibliographic information.

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Data Research, in partnership with Digital and the University of California, is building a Z39.50-based link between the catalog of the UC Davis library and the UC systemwide MELVYL automated catalog. Z39.50 allows a host system to search and retrieve data from remote information resources -- regardless of the hardware, software or operating system of the remote resources -- using the standard search procedures of the host system.

A Solid Commitment To Open Systems

Through its commitment to Z39.50 -- as well as to POSIX, X-Windows and other emerging standards -- Data Research has made a solid commitment to "open systems" in the truest sense of the word: systems that go beyond mere interconnectivity to provide complete interoperability regardless of hardware or operating system.

Make The Solid Choice For Your Library.

To find out how the Data Research System can expand the horizons of your library, contact Carl Grant, vice president of marketing, at (800) 325-0888 or via Internet at carl@dranet.dra.com.

DATA RESEARCH

THE SOLID CHOICE IN LIBRARY AUTOMATION

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(314) 993-8927 (Fax)

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DATARAM

DATARAM CORPORATION says THANKS!, to all at CAUSE90 for the opportunity to display our memory solutions and talk about low cost alternatives to boost your computing power. As a leading manufacturer of memory systems, all our boards feature a LIFETIME WARRANTY and are backed by the EXPRESS SPARES PROGRAM.

Low cost agressive pricing enables higher education to configure powerful workstations and servers while staying within budgetary constraints. Memory upgrades are performed easily and quickly for improved system response time.

Building a quality product is a given. Dataram recently received top honors for memory reliability with no failures, outscoring all others in an extensive study of DEC users conducted by RELIABILITY RATINGS INC., an independent research firm located in Needham, MA.

Our latest product offerings include memory for the DECstation 5000, DECsystem 5100, VAXstation 3100 mod.76, VAX 4000, SPARCstation 470/490, SPARCstation 2, and the HP9000 models 345, 375, 400, 425, and 433.

For today's best memory values, quick delivery of boards, and the highest reliability on the market, DATARAM has it! For more information, contact our regional sales offices:

EAST and SOUTH:	215-957-0071	(Including MS, TN, WV)
CENTRAL:	708-574-3710	(Including LA, TX, Canada)
WEST:	714-836-5988	(Including NM, CO, WY, MT)
LONDON, U.K.:	(06284) 74815	(European Headquarters)

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////DATATEL

HOT HOT HOT...these three words best describe the success of the Datatel/DEC relationship. *HOT HOT HOT* were also the three words that rang throughout the CAUSE Conference as Datatel, with its Mexican-cantina exhibit booth, served up chips and salsa to the many collegiate passersby. A crowd also drew to enter their "expert" estimate in Datatel's Mexican bean counting contest to receive a gift basket of Virginian favorites. Tuesday evening, at DEC's "Bahamarama" Party, Datatel handed out "secret decoder" hospitality cards inviting attendees to visit their Mexican Fiesta on Wednesday evening and decode their secret message to see if they were in fact a HOT HOT HOT Winner of a Mexican gift basket.

The Fiesta Party the following evening was quite a success as Datatel proudly served prize-winning chili recipes - recipes that came straight from the kitchens of their very own employees who received the honors as "chef de la chili" during their in-house chili cookoff event; the secret family recipes were shared with guests as copies of Datatel's very own Mexican cookbook were available for the taking. Accompany the variety of tasty Mexican morsels, guests were lead "South-of-the Border" by "Pepe", the strolling minstral. Everyone agreed his music provided the secret ingredient to Datatel's recipe for a festive evening.

Datatel featured *Envision*, the computer-aided software engineering tool for the 21st century, at this year's conference. Two Datatel representatives, Dr. Laird Sloan, Director of Marketing and Product Planning, and DeAnn Jelinek, Manager of Sales Support, gave a corporate presentation titled "Development of Administrative Data Processing Software Using Computer-Aided Software Engineering (CASE) Tools". This presentation described and illustrated how simple the development of a powerful new administrative software can be by using a CASE tool.

Demonstrations of Colleague, Datatel's fully integrated approach to meet the administrative needs of colleges and universities, and Benefactor, Datatel's comprehensive software package for fund-raising professionals, were also spotlighted.

Datatel has been in the computer industry for over 20 years and has provided quality software and services to more than 700 corporate and institutional customers. Datatel expressed appreciation for the relationship they share with prestigious higher education organizations, such as CAUSE, and look forward to future success in assisting colleges and universities achieve their administrative and fund-raising goals.

If you would like information about Datatel and its products, please contact Laird Sloan at Datatel's Fairfax, Virginia, headquarters, 703-968-4626.

Datatel
4375 Fair Lakes Court
P.O. Box 10825
Fairfax, Virginia 22022-0825
703-968-9000

DAVID Systems, Inc.

DAVID Systems' corporate mission is to provide complete LAN connectivity solutions. We extend these solutions to the unique needs of colleges and universities designing and implementing local and wide area networks. At this year's CAUSE90 conference, DAVID Systems was pleased to have demonstrated the following from our 10BASE-T LAN product family:

VolksNet™: This 12-port stand alone hub links IEEE 802.3 10BASE-T (Ethernet) devices into a high-speed network allowing your workgroups to access and share resources over unshielded twisted-pair wire.

DAVID ExpressNet® Concentrators and Hubs: The 5-slot and 12-slot intelligent concentrators offer compact installation of medium to large networks while providing integrated network management capabilities. The DAVID ExpressNet Hub is a single-slot 12-user hub that functions as a multi-port timing repeater and provides on-board physical-layer network management capabilities. The Hub can stand alone or can be converted to a Twisted-Pair module that plugs into a 5-slot concentrator for 12 to 48 users, or a 12-slot concentrator for up to 132 users. All network devices are interoperable and can be linked together to form larger networks. Hubs and concentrators are fully compliant to the 10BASE-T standard.

ExpressView™: Our newest addition to the DAVID LAN product line is our network management software package, ExpressView. It allows an entire network to be managed from a single management station using in-band SNMP (Simple Network Management Protocol) signalling through the network to communicate with the DAVID ExpressNet system. The software provides support utilities and efficiency tools via a graphical user interface (GUI) based on Microsoft Windows 3.0. running on a 386/486 PC platform.

For further information on DAVID Systems and our line of LAN connectivity products call (408) 720-6867.

DAVID Systems was pleased to have been a participant in this year's CAUSE90 and would like to express our thanks to the attendees at the conference for stopping by our booth. Since its founding in 1982, DAVID has been committed to providing higher educational institutions with voice, data, and LAN solutions specific to their academic needs. In particular, DAVID has been providing leadership in the physical-layer networking area via 10BASE-T technology. We look forward to continued participation in CAUSE and in meeting the future networking needs of the academic marketplace.

DAVID Systems

Setting a Higher Standard

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DIGITAL AT CAUSE '90

Opening Reception

Digital was pleased once again to sponsor the opening night reception. The gala affair was moved inside at the last minute due to some "bugs" in the form of pesky mosquitoes, but none of the enthusiasm of the participants was left outside, and we had a wonderful time. People really enjoyed themselves in kicking off their CAUSE '90 event and renewing old friendships.

Fun Run

About 75 hardy souls gathered on the beach just before 7:00 AM on Thursday morning for the Fun Run. The weather was great and the event was well organized by the hotel. Incidentally, for those who stayed around, the high winds on Friday morning would have made running on the beach impossible.

When all was said and done, we all had fun, but Alan Ward from the Connecticut Community College System and Rhonda Greenfeld from McGill University in Montreal were the respective men's and women's winners.

Congratulations to all who competed and especially to the winners!

Exhibit Area

Digital's exhibit area, built around the theme, "Innovation That Works", had many well received activities.

First, there were seminars held in a specially built room right in the exhibit. There were three different seminars offered.

Visions for the 90's

The presenters talked about the major industry events and trends from Digital's point of view. This was tied in to the educational computing environment. Among the topics discussed was OSF, distributed computing, network management, open systems, windowing, client-server computing, and multivendor integration. Attendees left with an understanding of Digital's commitment to standards, open systems, and multi-vendor integration, a perfect fit for the Education community in the next decade.

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The Infinite Desktop

Attendees learned how Digital intends to accomplish its vision of open computing with NAS, Network Application Support. NAS is a set of services and products that will let you integrate applications and share information across a multivendor environment. A video, and subsequent discussion, vividly demonstrated our open innovative approach to interoperability.

The DECImage Difference

The presentation began with an overview of document imaging concepts and described Digital's imaging strategy and products. We learned how Digital's standards-based imaging architecture is designed to protect your investments in hardware and people. Our strategy addresses needs for imaging across all levels of a system, for use throughout your institution.

Hospitality Suites

We were pleased to host a hospitality suite and glad to have a chance to visit with you on Wednesday evening. At the suite we distributed our annual CAUSE coffee mug, which we now believe to be a CAUSE tradition, hearing from many folks that a collection of our mugs is much valued item. Thanks for stopping by. We value our relationships with CAUSE attendees and the ideas and views you have of our products and programs.

TEI AND DCVN

The latest addition to the The Education Initiative is the Digital Customer Video Network (DCVN). The Education Initiative is Digital innovative program for reducing the cost of acquiring and implementing technology in educational institutions around the world. In adding DCVN, with special pricing, you will now have access to the valuable programs broadcast over that medium.

Please contact your local account representative, if you would like to know more about these programs or about Digital Equipment Corporation.

ANNOUNCEMENTS...

Digital made two announcements at CAUSE '90. First, we announced a Cooperative Marketing Program agreement with Systems and Computer Technology Corporation (SCT) to jointly market their Banner series of software with our VAX series of computers.

In a separate announcement, we announced that the Maple software was joining our CSLG Partners Program, part of The Education Initiative. Educational institutions, who are members of the Campuswide Software License Grant Program may receive site licenses for MAPLE at a reduced fee.

SEE YOU IN ANAHEIM !!!

EDS

Developing Solutions that Promote Higher Levels of Learning

CAUSE90

The success of CAUSE90, gave us the opportunity to meet and introduce our information technology solutions to many conference participants. We would like to thank all CAUSE attendees who visited the EDS booth.

The opportunity to talk with each of you enhanced our understanding of your institution's unique needs. This allows us to tailor our technology solutions to address your specific requirements.

In your marketplace today, effectively competing for qualified students is critical to your institution's success. This often means reaching out to your potential students - "expanding your campus."

Distance Learning - Unlocking Education Boundaries

At CAUSE90, we demonstrated our "Distance Learning" tool to enable institutions to expand their student base potential. It also creates unlimited opportunity for students to explore and learn.

EDS' distance learning solution -- ***knowbility*** -- is a software-driven, media-independent educational tool. ***knowbility*** provides your institution with a real-time, networked solution that maximizes instructional control and student interaction. The simplicity and unique capabilities of ***knowbility's*** touch screen "smart podium" and the student response keypads were demonstrated at CAUSE90.

knowbility is a feature-rich, flexible opportunity for your institution to "reach out" and expand your campus and student base.

Your Information Technology Partner

EDS has the technical expertise and resources to expand your campus and learning potential of your students through efficient, objective, and responsive information technology and communications services. More important, our services enable you to take full advantage of technology without having to devote your full attention to it. You can concentrate on what you do best: EDUCATION.

Thank you again for the opportunity to discuss our information technology solutions with the many attendees that stopped by our booth. For more information about ***knowbility*** and our information technology and communications services solutions for higher education, please call (303) 980-8993.

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Chicago, Illinois 60611
(312)368-1800

Ernst & Young (E&Y) is proud to have once again actively participated in the CAUSE National Conference and to have shared with you our powerful Information Technology tools and techniques available for effective Information Systems development in the future. As we advance into the 1990's, we look forward to providing CAUSE system developers with advanced capabilities to employ emergency technologies and attain higher personal productivity.

Ernst & Young introduced a number of products and participated in various activities for this year's CAUSE 90 attendees including:

Ernst & Young Navigator Systems Series^{sm} - E&Y introduced the Navigator Systems Series^{sm} to CAUSE 90 attendees in the demonstration area. The Navigator System Series^{sm} is E&Y's approach to building better information systems - systems that work with business strategies, not against them. Navigator System Series^{sm} represents a comprehensive, integrated approach to systems planning and building.

Redevelopment Engineering - lots of excitement was generated by E&Y's demonstration of Redevelopment capabilities for future information systems development. Significant productivity and cost reductions can be realized through Redevelopment Engineering as campuses automate the generation of existing system documentation or take advantage of relational database technology without redesigning existing systems.

Refreshment Break - E&Y was proud to sponsor the Wednesday morning refreshment break for CAUSE 90 attendees. Coffee mugs were made available sporting the new E&Y logo recently designed for the firm.

CAUSE Strategic Planning Advisory Council - E&Y participated in the 1990 meeting of the CAUSE Strategic Advisory Council. This is the third year E&Y has served on this most important CAUSE committee. Lively discussion helped identify external factors and future directions that are likely to affect higher education computing and information technology.

CAUSE Corporate Member - Finally, E&Y proudly serves CAUSE as a corporate member, furthering E&Y's National focus on higher education clients. As the computing needs of higher education become even more complex, E&Y continues to develop strategic partnerships with leading organizations such as CAUSE to help information technology professionals plan for the future.

ERIC

GKA

CAUSE90

GKA was pleased to co-sponsor the Wednesday afternoon coffee break at CAUSE90.

Company Profile

GKA is an executive consulting and management services firm specializing in support to higher education. Since its founding in 1977, GKA has assembled a cadre of senior professionals with first-hand experience as executives and technical specialists in universities and colleges. GKA has developed a reputation as a firm composed of strategic thinkers and creative problem solvers who are experienced in managing change and who understand the capacities of institutions to absorb change. GKA continues to enhance its information systems and telecommunications consulting capabilities to keep pace with higher education's increasing demand for information technology solutions.

Involvement in Higher Education

The core of GKA business is service to higher education institutions, executives and governing boards in a broad range of areas: transition support, strategic planning support, organizational evaluation, executive recruitment and search consulting, software and hardware consulting, telecommunications consulting, project management, and interim management. A representative sample of GKA's recent clients is presented below:

Agnes Scott College
Brandeis University
Columbia University
Drew University
Duke University
Fayetteville State University
Gettysburg College
Indiana University
Keene State College
Loyola University of Chicago
Massachusetts Board of Regents
Mount Holyoke College
New York University
Plymouth State College
Radford University
St. Lawrence University
St. Louis University
Smith College
Southwestern Baptist Theological Seminary
State University of New York System
Union Theological Seminary
University of Alabama-Birmingham
University of Delaware
University of New Hampshire
University of Pennsylvania
University of Pittsburgh
University of Tulsa
University of Texas M.D. Anderson Cancer Center
University System of Georgia
University System of New Hampshire
Washington University
Wayne State University
Western Carolina University
Westfield State College

GKA

Range of Services

The advance of technology is altering the way institutions collect, store, analyze, disseminate, and use information. University and college executives face an increasing array of technology-related challenges. GKA combines technical expertise and management know-how to support the design and implementation of effective information technology solutions. GKA's Information Technology service portfolio encompasses:

Evaluation and Planning
Operations Assessment
User Requirements Analysis
Internal Plan Review
Strategic Plan Development

Procurement and Implementation
Computer/Telecommunications System Design
Systems Integration
RFP Preparation/Evaluation
Vendor Negotiations
Project Management

Network Planning/Long Distance Service Analysis
Performance Appraisal
Topology/Technology Design
Cost/Performance Optimization

Specialized Services
Office Automation/Cabling Analysis and Design
Facilities Design/Programming
Interim Management
Executive Recruitment
Evaluation of Business Opportunities

For additional information, contact:

John F. Leydon, Principal
GKA
2505 Hillsboro Road, Suite 302
Nashville, Tennessee 37212
(615) 297-3880
Fax: (615) 297-3884

ERIC

Hitachi Data Systems

CAUSE 90

Hitachi Data Systems is proud to be a corporate sponsor of CAUSE. We are pleased to have participated in CAUSE90 in Miami Beach, Florida. Hitachi Data Systems came into being on May 1, 1989 and CAUSE90 was our first CAUSE National Conference. The people we met were warm, friendly, and a pleasure to talk with.

"Meeting The Challenges of The 1990's" was the theme of our booth, where HDS products and services were highlighted. Our EX Series mainframe computers; HDS 7390 Disk Storage Subsystem; HDS 7490 Cartridge Tape Subsystem; HDS 7900 Semiconductor Disk Subsystem; HDS Engineering & Scientific products, including the HDS Integrated Vector Facility; HDS Education Services; and HDS Customer Support Services were presented.

We further participated in CAUSE90 by co-hosting the Wednesday and Thursday afternoon refreshment breaks. Also, HDS donated a Toshiba T1000SE Notebook computer with battery pack and carrying case. CAUSE held a drawing at the Thursday luncheon where this laptop personal computer was given away to a lucky CAUSE90 attendee. All in all we had a great time and we look forward as a CAUSE corporate sponsor to participating in CAUSE events in 1991.

Company Profile

Hitachi Data Systems (HDS) was founded on May 1, 1989 when Hitachi Limited and Electronic Data Systems joined forces to acquire and expand National Advanced Systems. NAS had established a good reputation for reliable, high quality products; a strong marketing force; a well-respected hardware organization; and a proven systems engineering group. Hitachi Data Systems built upon this heritage and was a billion dollar sales company from its first day. Since it's founding HDS has grown by over 200 new customers who have chosen HDS to satisfy their industry-standard mainframe and storage systems requirements. We've expanded our organization to better serve your needs. We now operate in 36 countries around the world.

Hitachi Data Systems, with Hitachi Limited, designs, manufactures, sells, supports and services industry standard mainframes and storage systems of the highest quality and reliability. HDS is a prominent supplier of high-performance mainframe and storage systems to some of the world's leading corporations in segments as diverse as government, aeronautics, insurance, securities, manufacturing, banking, and of course education.

HDS

Hitachi Data Systems

The HDS Ex Series of mainframe computers includes processors spanning the entry-level, mid- and large-range, with an incremental growth path that ensures you have the processing power you need as you need it. The HDS EX Series offers users the highest quality and the most flexible range of power, features, such as the EX Optical Channel Subsystem, and upgrades available in the industry-standard market today. EX Series users benefit from comprehensive solutions to diverse online, batch, engineering/scientific, distributed processing, and mixed vendor challenges. CAUSE members can gain the competitive edge they need to succeed in today's IS environments while being assured of an avenue for rapid growth in the future - an advantage that marks the distinctive, enduring value of all HDS products and services.

The HDS storage systems consist of the HDS 7390 Disk Storage Subsystem; the HDS 7490 cartridge Tape Subsystem; and the HDS 7900 Semiconductor Disk Subsystem. The HDS storage systems are a complete set of high-performance, most reliable storage solutions that attend to every area of your mainframe-based IS computing requirements. The levels of reliability, quality, unique features, and performance that characterize HDS storage subsystems make IS users around the world the clear winners.

HDS Education Services

HDS Education Services offers a new generation of Applications & Systems Training for a new decade of challenges. HDS Education Services offers comprehensive course curricula that cover the full range of challenges in today's computer systems environment: Operating Systems; DASD Management; Languages and Applications; Interfaces, Networks and Communications; General and Management; and Personal Computer Software. You can have courses customized to fit your needs. Choose public courses or have them delivered on-site. Take advantage of the HDS Training Needs Analysis. Enjoy special NasPA discounts or the tremendous savings offered through the Partnership Training Program. Contact HDS Education Services at 1-800-543-2979 for more information.

Hitachi Data Systems is uniquely positioned to help CAUSE members address the challenges of the 1990's. With a mainframe platform and storage systems that supports administrative and academic processing requirements, HDS offers financially attractive computing solutions for the 1990's.

For additional information about any of HDS' products and services contact:

Gene England
CAUSE Communicating Representative
Hitachi Data Systems
500 Park Blvd. Ste 1200
Itasca, Illinois 60143
708-773-8150

Note: Hitachi Data Systems, HDS, HDS EX Series, Optical Channel Subsystem, 7390 Disk Storage Subsystem, 7490 Cartridge Tape Subsystem, 7900 Semiconductor Disk Subsystem, and Integrated Vector Facility are trademarks of Hitachi Data Systems Corporation.

ERIC

IBM SHOWCASES EMERGING TECHNOLOGIES AT CAUSE90

IBM's Academic Information System (ACIS) is proud to have been a CAUSE Corporate Sponsor for this year's conference in Miami Beach.

Addressing the area of administrative computing, IBM has teamed with a number of IBM Business Partners to provide a wide-range of administrative and financial solutions. Eight Business Partners joined IBM at CAUSE90 to demonstrate applications on the Application System/400*, the RS/6000*, the S/390* and the Personal System/2* product lines. Business Partners demonstrating in the IBM exhibit area were:

American Management Systems	SCT
Information Associates	Integral
BSR	CMDS
Champlain Software	Universal Algorithms

Highlights of the applications shown at the conference include:

Harvard Executive Education

For five week periods throughout the year, key executives from the American and often, international, business community meet at the **Harvard Business School.** One of the first "lessons" these executives learn soon after arrival is how the IBM PS/2* in their dormitory room is integral to their stay at Harvard. The applications, implemented by Harvard on the IBM Office Vision/2* platform, include the online "yearbook" which provides information on classmates and includes biological information and interests profile, career history and an accompanying color photo. Also supported is the "coursework" application, providing complete case study information with voice/data capabilities.

Automatic Advisor Alert

Implemented at **Dakota State University,** this application uses IBM AS/400* ImagePlus technology to assist advisors in tracking student progress - from application to graduation. All relevant records and correspondence including high school transcripts, letters of recommendation and loan information, are scanned into the student file, giving advisors and administrative staff the ability to see as displayed images a complete file on each student. The split screen allows the user to see both the image of the actual documents which were scanned as well as information from the institution's student information database.

Classroom Scheduling and Modeling

Because classroom scheduling affects relations with the academic community, it must be performed in a manner sensitive to faculty needs. In response to this, IBM Business Partner **Universal Algorithms** developed Schedule25 which combines speed, reliability and a shared language to handle the toughest assignment problems. Running on the IBM RS/6000 platform, the computer time for Schedule25 decisions can be as little as five minutes, even for very large campuses.

ERIC

Human Resource Management Solutions

The strategies and systems that human resource professionals choose vitally affect the future of an organization. For managers facing these choices, IBM Business Partner, **Integral**, offers human resource applications compliant with Systems Application Architecture (SAA). Integral's HR Vision product family implements a sophisticated electronic office on the workstation - connecting users directly with each other and with the centralized Human Resource Management System.

Multimedia Technology in Administration

Multimedia, the technology of sound, images, animation and voice combined on a computer, seems poised to become the technology of the 90s. One of the foremost experts in multimedia computing for higher education, Dr. Fred Hofstetter, opened the last day of the conference with a special general session on the use of this technology in administrative settings. Using IBM PS/2 platforms configured for multimedia applications, Dr. Hofstetter showed how recorded music and voice narrative, and scanned color slides, plus text and graphics, can be orchestrated to present information in new and more exciting ways. For both classroom instruction and administrative settings, Dr. Hofstetter provided a glimpse into the future of educational technology.

CORPORATE PRESENTATION

OS/2 VS. Windows 3.0

In the fast-growing world of personal computing, graphical interface alternatives for the PS/2 are often confusing. In a multimedia presentation, IBM Technical Consultant Larry Brynes discussed the difference between OS/2* Presentation Manager and DOS Windows 3.0 from a user perspective.

CORPORATE SPONSORSHIP

Carnivale Miami

More than 1,000 people at CAUSE90 attended the IBM sponsored Carnivale Miami banquet. At the dazzling final evening of the conference, attendees were greeted at the door by dancers elaborately costumed as parrots, feasted from three buffet tables featuring "live" centerpieces, were entertained by seven foot tall juggling clowns, and were charmed by the antics of performing tropical birds. Palm trees, neon pink flamingoes, grass huts, island flowers and Latin melodies filled the ballroom of the Fontainebleau Hotel to create a true tropical paradise.

For more information on IBM products and administrative solutions, please contact:

Rob Baum
Manager
Library & Administrative Computing
IBM Academic Information Systems
472 Wheeler Farms Road
Milford, Conn 06440
(203) 783-7350

* Indicates a registered trademark of the IBM Corporation.

INFORMATION & COMMUNICATIONS, INC.

Information & Communications, Inc.

Serving Higher Education for Twenty One Years

Information & Communications, Inc. (ICI) valued the opportunity to attend CAUSE90 in Miami, Florida. When the "higher education information system community" comes together, the interaction and discourse that occurs is truly dynamic.

ICI appreciated the overwhelming participation in the SAFE Matching game. Many CAUSE attendees found their matches and several lucky players were awarded CD players and gift certificates.

As many of you were stopping by the ICI booth, we enjoyed the conversation and questions regarding ICI products and services. ICI featured its SAFE Financial Aid Processing System.

SAFE 8.0 is ICI's system for the IBM mainframe environment in use at over 50 institutions. Evolving over the past twenty one years to meet the ever changing demands of financial aid processing, SAFE 8.0 is a comprehensive, online, real-time solution to aid delivery.

SAFE is designed as a stand alone system that can integrate into a wide variety of student information systems. The SAFE database utilizes a single point I/O VSAM type cluster. This structure simplifies interface design and integration with your other administrative systems. SAFE is written in COBOL and operates with CICS. Source code is included with every SAFE site license.

ICI also promoted SAFE PC, its MS DOS based version for IBM PCs or compatibles. SAFE PC combines the features and capabilities of mainframe systems with the convenience and simplicity of the PC environment.

For further information regarding SAFE 8.0, SAFE PC, custom development or consulting, please call us directly at 800-776-9966.

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INFORMATION ASSOCIATES®

Information Associates Introduces Windows Technology at CAUSE90

At CAUSE90 in Miami Beach, Information Associates (IA) announced that IA applications software is now available to run under Microsoft Windows version 3.0, a new graphical user interface (GUI) that runs on MS-DOS-based personal computers.

Like others in the industry, IA has long maintained that the benefits of GUIs are enormous. Now we have put our beliefs into practice.

A recently released study co-sponsored by Microsoft reinforces our decision to incorporate Windows 3.0 into our products. Among findings of the study are these statistics:

- GUI users work faster, better, and with higher productivity than their character-based environment counterparts.

  **On average, experienced GUI users completed 35 percent more tasks than character-based environment users in the same time; additionally, experienced GUI users accomplished 58 percent more correct work in the same time.*

- GUI users express lower frustration and lower fatigue than character-based environment users after working with microcomputers.

  **GUI novices attempted 23 percent more tasks than character-based environment novices when given new tasks to perform.*

- GUI users explore and learn more of the applications' capabilities than do character-based environment users.

  **After spending two days learning to use microcomputer software, GUI novices rated their frustration at 2.7 (out of 10), whereas character-based environment novices rated their frustration much higher at 5.3.*

Overall, the research by Temple, Barker & Sloane, Inc. demonstrates that significant productivity benefits accrue from the move to graphical computing.

Easel Corporation and IA Form Alliance

Easel Corporation, a pioneer in the concept of graphic-based hardware and software technology, is working with Information Associates to bring graphical user interface capabilities to Series Z software. The EASEL product -- a unique graphical application development environment -- is emerging as the industry standard for building highly visual applications and graphical user interfaces.

Thomas W. West Wins IA-Sponsored CAUSE ELITE *Award*

During a special awards luncheon on November 28, CAUSE named Thomas W. West winner of the first CAUSE *ELITE* Award for Exemplary Leadership and Information Technology Excellence. Dr. West, Assistant Vice Chancellor, Information Resources and Technology, California State University (CSU) System, was chosen by the 1990 Recognition Committee from a field of 107 nominees.

In his role at CSU, Dr. West is responsible for strategic planning, coordination, implementation, and management of information resources of the 20-campus, 360,000-student system. His achievements at CSU include CSUNET, a regional network connecting the 20 CSU campuses, some California community colleges, and selected state high schools. Before CSU, Dr. West directed information and computing services for the Indiana University System.

In honor of Dr. West, CAUSE has donated $5,000 to be divided among general scholarship funds at Thiel College, Indiana University, and the California State University Foundation.

Information Associates sponsored the CAUSE *ELITE* Award. This award continues an 11-year tradition of recognition award sponsorship by IA.

IA Helps LACCD Improve Services

Information Associates publicized a new client relationship at CAUSE90 in Miami Beach:

Keeping track of more than 110,000 students, 8,000 faculty and staff, and nine colleges at the largest community college district in the world is a mammoth task -- one that Information Associates is committed to easing.

Under the terms of a new $3 million-plus contract, IA will supply integrated administrative software systems to support student services and financial and human resources operations of the Los Angeles Community College District (LACCD).

"Information Associates welcomes the opportunity to serve LACCD," said John Geraci, IA's president and chief operating officer. "As a corporation and as individuals, we are committed to helping LACCD succeed in serving its students while meeting the requirements of the State of California Community Colleges."

LACCD will use the newest releases of Information Associates' Series Z software: Student Information System Plus, Human Resource System Plus and Financial Records System Plus. These new Series Z Plus products will offer users greatly extended capabilities including a graphical user interface, relational data base technology, distributed/cooperative processing, and enhanced functionality.

Information Associates, IA, the IA logo, and Series Z are trademarks of Information Associates, Inc. Because of the nature of this material, numerous hardware and software products are mentioned by name. In most, if not all cases, these product names are claimed as trademarks by the companies that manufacture the products. It is not our intent to claim these names or trademarks as our own.

For more information. contact Bill Mahoney, Vice President of Marketing, Information Associates, 3000 Ridge Road East, Rochester, New York 14622, (716)467-7740.

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information builders inc.

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Information Builder's FOCUS fourth generation language (4GL) and windowed application development facilities are unsurpassed for processing and controlling data. With FOCUS, users gain ease of use and higher productivity whether reporting and analyzing data, or building complete applications. FOCUS provides:

- Integrated decision-support and development tools
- A tenfold increase in productivity over developing applications in COBOL with embedded SQL
- Portable applications that run on any hardware and drive a variety of database engines

Users can write simple English phrases to query data sources and produce reports, including row-oriented financial statements. FOCUS generates business graphics, formal statistical analyses, and even spreadsheets, with one, integrated set of 4GL tools. For novices and casual users, there are automatic information and application generators with windowed, "point-and pick" displays for creating files, producing reports and developing database maintenance applications — all without coding.

FOCUS unifies data analysis and database maintenance functions in a single language available on mainframes, minicomputers and PCs. Applications and coding skills are portable across operating environments, and inter-platform connectivity facilities enable FOCUS users to access distributed data and execute remote procedures on nodes throughout a network.

Universal Access to Data

While most database engines provide access to only their native data structures, FOCUS delivers direct access to virtually every source in the data center—without conversion or reentry of data. All of the following relational and non-relational data sources are accessible with all of the FOCUS facilities while the physical details of the structures remain transparent to users:

Mainframe	Midrange	Microcomputer
Adabas	Adabas	ASCII
Datacom/DB	ASCII	dBASE III, IV
DB2 *	C-ISAM	LOTUS 1-2-3
IDMS, IDMS/R	DBMS	OS/2 Extended Edition
IMS	DMS,DMS/TX	Paradox
ISAM	Ingres *	Rbase
Model 204	ORACLE *	SQL Server
QSAM	PACE	
SQL/DS *	Rdb *	
System 2000	RMS *	
Teradata	SPEED2	
TOTAL (Cincom)	Teradata	
VSAM *	Sybase *	

*** Read and Write Access**

designers and builders of information systems

ERIC

Powerful Relational Capabilities
FOCUS supports joins between the datasets it accesses. In a single operation, FOCUS users can consolidate data from multiple relational tables or join relational tables to non-relational sources,. such as IMS, RMS or VSAM files.

FOCUS Updates External Databases
FOCUS generates and translates native SQL syntax. Users can issue interactive requests in either language to update relational sources on many platforms — mainframe users can update DB2, SQL/DS, Teradata and VSAM files, VAX users can update RMS and Rdb files, as well as Oracle, Ingres and Sybase databases, and PC users can use PC/FOCUS against the Ashton Tate/Microsoft SQL Server or IBM's OS/2 Extended Edition.

Comprehensive Tools
FOCUS combines integrated decision-support facilities with automated tools for building applications. Users have the choice of the 4GL or the windowed point-and-pick facilities for producing reports and graphs. For specialized needs, the FOCUS language is rich in custom-formatting syntax. CASE-based FOCUS Application Creation Tools (FACT), code generators and visually-oriented screen and window painters fully automate the development process, substantially reducing the time and effort required to prototype and implement new applications.

Expert System Tools
Information Builder's LEVEL5 expert system facilities allow organizations to capture specialists' knowledge in systems that end users can run to diagnose problems and perform analyses. Compatible versions are available for IBM mainframes and PCs, DEC VAX minicomputers, and Apple Macintoshes — LEVEL5 applications are portable between those environments.

Information Builders is implementing an "expert" mode in FOCUS to allow application builders to integrate LEVEL5 expert systems within FOCUS applications. These integrated applications will have access to every source of data that FOCUS can read.

Integration with Repositories
The FOCUS Application Control Environment (ACE), provides a centralized mechanism for managing FOCUS applications throughout their life cycles. ACE is a the repository for applications (and components — including data), and holds and applies access rules. Using ACE, MIS directors can track system usage, developers have a convenient application-deployment mechanism, and end users have centralized access to all of the site's FOCUS applications.

ERIC

INTEGRAL™

INTEGRAL
Corporate Headquarters
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Walnut Creek, CA 94596

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FAX (415) 944-1416

COMPANY PROFILE

INTEGRAL is one of the world's largest suppliers of application software for IBM mainframe, midrange, and PC hardware platforms. With 350 employees working out of offices in eight cities across the U.S. and Canada, the firm develops and markets a full range of financial and human resource management software supported by comprehensive product training and consulting.

INTEGRAL's human resource management systems were the first to comply with the standards established by IBM's System Application Architecture (SAA). INTEGRAL's HRMS products were written only with those tools specifically identified as SAA common programming interface products:

- VS COBOL II
- Cross System Product (CSP)
- Structure Query Language (SQL)
- Query Management Facility (QMF)

INVOLVEMENT IN HIGHER EDUCATION

Today, INTEGRAL's DB2 human resource systems are in use by over 70 higher education clients. Originally founded in 1972, INTEGRAL rapidly attained an excellent reputation as a developer of human resource software specifically designed to meet the needs of institutions of higher education. Even in its expansion to other vertical markets, INTEGRAL continues to recognize the special needs of the academic community and to aggressively support those needs in both its financial and human resource products.

PRODUCT LINE

INTEGRAL offers an entire spectrum of financial and human resource management products for IBM and IBM-compatible mainframe, midrange, and personal computers:

FINANCIAL	HUMAN RESOURCE
MAINFRAME	
General Ledger	Human Resource Administration
Accounts Payable	Payroll Management
Accounts Receivable	Benefits Management
Purchasing	Applicant Management
Project Accounting	Position Control
Fixed Asset Accounting	Pension Benefits Administration
Electronic Data Interchange	Flexible Compensation
Materials Management	HR Vision
MIDRANGE	
General Ledger	Human Resource and Benefits Manager
Accounts Payable	Payroll Manager
Purchase Order	Position Control
Accounts Receivable	
Fixed Assets	

INTEGRAL

FINANCIAL

PERSONAL COMPUTER
General Ledger
Accounts Payable
Project Accounting
Fixed Asset Accounting

HUMAN RESOURCE

Affirmative Action
Organizational Charting
Distributed Human Resource Administration
Compensation Planning and Administration
Succession Planning
HR Vision

These products are available in multiple technical environments: mainframe systems use standard COBOL with VSAM or with an application generator (CSP) and accompanying database technology (DB2). INTEGRAL products are designed to include a lengthy list of built-in features that are of significant value to the higher education community. Our products are in operation at numerous two- and four-year colleges and universities, local community colleges and land grant institutions throughout the United States and Canada. These colleges range in size from 1,000 to 80,000 employees and include the following:

- o Boston College
- o Harvard University
- o Rutgers University
- o Catonsville Community College
- o Indiana University
- o York University (Canada)
- o University of Minnesota
- o New York University
- o Colorado State University
- o University of Chicago
- o University of British Columbia

Unique higher education-related features in the INTEGRAL Applications include capabilities such as:

- o Multiple concurrent appointments (e.g., assistant professor and dean)
- o "Without salary" appointments
- o Management of curriculum vital information
- o Special forms of payment (e.g., stipends, honoraria)
- o Payment start and stop dates by appointment and account
- o Contract and grant certification
- o Position control
- o FTE tracking and control
- o Salary distribution to multiple accounts (e.g., general fund and grants)
- o Faculty and staff salary analysis
- o Tenure tracking

INTEGRAL, a CAUSE member since 1979, has participated annually at the CAUSE National Conference since 1974.

Contact: Kathy Urbelis
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Walnut Creek, CA 94596
Telephone: 415/939-3900

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interVoice®

The RobotOperator System from InterVoice can help your University put State funded money or contributions back into higher levels of education rather than hiring more personnel to answer simple questions for students. The System lets your college focus on Education and leave the time consuming busy work up to the RobotOperator System.

Increased Student Services

The RobotOperator System allows your school to offer a variety of services to your student body - beginning with applications and following through to job placement.

The RobotOperator/2 System responds to many types of student inquires such as:

- Applications - Checking the status of applications.
- Financial Aid - Requesting financial aid packets.
- Dorm Reservations - Reserving dormitory rooms.
- Curriculum Advising - Scheduling advisor appo: 'ents.
- Registration - Registering for classes.
- Campus Bulletin-Board - Obtaining information and tickets.
- Grade Reporting - Receiving early grade results.
- Graduation Application - App' 'ing for graduation.
- Transcript Requests - Requesting transc:ipts be sent.
- Job Placement - Scheduling interview appointments.

Students want quick access and fast processing of information concerning their academic and campus life.

Decreased Operating Cost

Automating labor intensive tasks can lead to substantial direct long-term dollar savings in training and payroll and can also lead to indirect savings because of such operating benefits as:

Stabilization: Less peak load "staff-ups"

Streamlining: Reduces paperwork

Efficiency: Less redundancy and rework

Utilization: Maximize use of existing databases and mainframes

Effectiveness: Increases the value of face-to-face advising

ERIC

What Makes The RobotOperator System Different From Other Voice Response Systems?

The RobotOperator System is based on the IBM Personal System/2. Users can rely on service from both InterVoice and from IBM technicians. We are the only voice response company able to offer this level of service.

The system's flexibility and connectivity are un-equaled. The RobotOperator System can interface to a broad range of host computer systems with ease. Your school won't have to worry about investing in more hardware.

The Competitive Edge

Voice Automation is a tool which many educational institutions are using to compete for student enrollment. InterVoice has made voice automation simple to install and use, cost effective, flexible and friendly. The RobotOperator System is designed to give your school the competitive edge for maintaining and expanding enrollment.

The RobotOperator System improves operational efficiency and allows your callers to get their desired information when they want it, without being put on hold. People around the globe are finding they like having a friendly, human-quality voice provide accurate information, 24 hours a day, 7 days a week.

Most routine questions about class scheduling, student activities and graduation procedures can be answered without human intervention. If callers do need to speak to someone, they can easily be transferred to the correct department. Operators and student service personnel are free to be productive in more crucial areas, thus allowing you to deploy your budget dollars elsewhere.

We would also like to send you a free sample diskette so you can learn even more about this system. Call us at 214-497-8862 to order your copy.

The System Grows With You

The RobotOperator System's open architecture means that the system can grow as your institution's needs grow. You can start with as few as four lines and expanded to hundreds. InterVoice offers more features and options on its RobotOperator than any other vendor in the voice response industry.

The RobotOperator System is a human quality, digitized voice system which responds to input from callers by push button or rotary dial telephones, personal computers and InterVoice's speech recognition technology. The RobotOperator System automates many telephone operator functions, increases system payoff through high levels of operator productivity and provides extended student service. InterVoice leads the voice response industry in technology, ease of installation and on-going service.

interVoice®

17811 Waterview Parkway • Dallas, Texas 75252 • (214) 669-3988

Cause '90

IRON*Soft* Ltd.

introduced the new release of their featured product

Academic Audit™

The P.C. Solution to Degree Audit and Advising.

Cause '90 attendees who viewed the new product at the IRON-*Soft* booth all agreed that it was it was a Audit/Advising package ready for the 1990's. We would like to thank all of the convention attendees that dropped by for a demo and to pick up our latest information. IRON-*Soft*, Ltd. was proud to giveaway a $100.00 cash as this year's door prize to a lucky Cause attendee! We believe many colleges and universities are searching for ways to reduce to volume of work on the mainframe. Degree audit happens to be an adminstrative function that is well suited for the P.C. environment. Why not utilize the hardware resources your college already has?

Academic Audit™ delivers the same features found in mainframe systems.

Release 2.0 has a new look and feel to it!
Due out in the Spring of '91

Re-designed menu structure
Function key control
"Advisor-friendly" selections
Enhanced group reporting

For more information:

IRON-*Soft*, Ltd.
631 Iron City Drive
Pittsburgh, PA. 15205
1-800-776-SOFT Ext. 215

continued...

ERIC
Full Text Provided by ERIC

Why Degree Audit should be on a P.C...

THE BENEFITS

*Ease of installation. No need to wait years to see your catalog automated.

*Response time. Distributed processing power provides instant access to anyone who needs it.

*Contention for college resourses. Use the resources and hardware your school already has. Academic Audit™ can operate on a 2 floppy, 256K RAM, IBM/Compatible PC.

*Data integrity. We maintain the integrity of your mainframe database by using downloaded ASCII student record files.

*Purchasing options. Site-license fee is adjusted when purchased for only an individual school of the university.

... WITHOUT GIVING UP ANY FEATURES !

*On-line advising. Provides "what if " capabilities for any major in the system.

*Degree audit. Handles up to five different programs for a single student. Each requirement check will include the number of courses, the number of requirements, and a total credit check.

*Reports. In addition to the degree audit, many customized group reports are available. For example, you can target your problem students, search for the high honors list, or determine how many students have taken the prerequisites for a particular course.

*Multiple catalog editions. Retain as many catalogs as necessary.

*Multiple qpa calculations.

*Repeated courses. Handles repeated courses, repeatable courses, and cross-listed courses according to your school's policy.

*Audits complex degree requirements. Can properly audit for such things as course number changes, distribution checks, and requirements by number of credits as well as number of courses.

JOHN MINTER ASSOCIATES

Company Profile

John Minter Associates is a research and publishing firm specializing in comparative performance and planning studies and databases for colleges, universities, and their associations nationwide and abroad.

Founded in 1975, JMA maintains over 4,000 data series on college and university performance and characteristics. Database services are conducted by The National Data Service for Higher Education, a division of JMA.

JMA publishes books, monographs, occasional studies, and PC databases focusing on financial and finance-related statistics and information.

JMA manages Data Exchange Networks, collecting, processing, and analyzing comparative data for a number of associations and college peer groups.

Over the years, JMA has developed the most comprehensive and accurate financial database in higher education available anywhere in the country.

Involvement in Higher Education

The company began its support of higher education with longitudinal studies of both private and public institutions of higher education in a series titled *The Bowen-Minter Report.*

Annually, JMA prepares financial ratio analyses for over 300 colleges and universities. The company also develops national norms for college and university financial ratios, published biennially by KPMG Peat Marwick.

JMA was the first to make U.S. Department of Education HEGIS and IPEDS survey data widely available on diskette for PC-based policy analysis.

JMA manages a number of Data Exchange Networks of colleges and universities including Public Urban University Student Affairs Officers, Independent Colleges and Universities of Pennsylvania, Independent Colleges and Universities of Maryland, Nazarene Colleges, and Colleges of Chiropractic.

The firm's clients have included:

Adelphi University
Alabama A & M University
Alfred University
Apple Computer, Inc.
Arizona State University
Augustana College
Ball State University
Bethune-Cookman College
California State University, Central Office
Carnegie Commission
Case Western Reserve University
Claremont McKenna College
Coopers & Lybrand
Cuyahoga Community College
Datatel
Department of Defense
Defense Training and Performance Data Center
Duquesne University
Ernst & Whinney
Emory University
First National Bank, Chicago
Franklin and Marshall College
Gettysburg College
Harvard Medical School
Hewlett-Packard Company
Howard University
Independent Colleges and Universities of Pennsylvania
Indiana University
Information Associates
Iowa State University
KPMG Peat Marwick
Lewis and Clark College
Loyola University, Chicago
Marriott Corporation
Memphis State University
Minnesota State University

Mississippi State University
National University
Northern Illinois State University
Oregon State University
Otterbein College
Pepperdine University
SUNY, Stony Brook
Seattle Pacific University
Southern Illinois University
St. John's College
St. John's University
Texas Christian University
The American University
TIAA-CREF
Tuskegee University
University of Alabama
University of California, Berkeley
University of Colorado
University of Connecticut
University of Denver
University of Georgia
University of Maryland, College Park
University of Massachusetts, Boston
University of Miami
University of Michigan
University of Missouri, St. Louis
University of North Carolina, Greensboro
University of Notre Dame
University of San Diego
University of Southern California
University of Texas
University of Utah
University of Wisconsin
University of Wyoming
Vanderbilt University
Washington State University
Wilkes College
Wright State University
Yeshiva University

Products and Services

Products:

Annual Print Publications (representative list)

- Management Ratios for Colleges and Universities
- Salary and Wages Outlay
- Enrollment Management Ratios
- Freshman Class Ratios
- Identifying Comparable Academic Institutions
- Faculty Salary Index

Annual Magnetic Media* Publications Segmented by Carnegie Commission Institutional Taxonomy (representative list)

- Directory of Higher Education (HEP annual lease for mailing)
- College and University Revenue and Expenditures
- Opening Fall Enrollments
- Degree Completions
- Faculty Salaries
- Institutional Characteristics
- Freshman Class Profiles
- Student Body Profiles
- Student Charges and Financial Aid
- Expenditures for Research
- Federal Appropriations
- * MS-DOS platform; standard diskette and tape formats; standard file formats used by popular PC and mainframe software

Services:

- Financial Ratio Analysis
- Custom Policy Analysis Databases
- Institutional Performance and Planning Ratio Analysis
- Higher Education Directory Segmented Mailing Lists

CAUSE welcomes John Minter Associates as a new corporate member.

Contact:

John Minter
President
John Minter Associates
National Data Service
for Higher Education
2400 Central Avenue
Boulder, CO 80301
(303) 449-8110

KPMG Peat Marwick

Addressing Information Technology Issues for the 21st Century University

KPMG Peat Marwick was pleased to have participated in CAUSE 90 in Miami, Florida. Our participation included a number of activities including sponsoring the Tennis Tournament, a booth in the Corporate Demonstration Area, and a corporate presentation on "End User Computing - Where is the Payoff".

The booth in the Corporate Demonstration Area focused on opportunities in Executive Information Systems. In the booth, we demonstrated MacDSS, a Decision Support System developed jointly by KPMG Peat Marwick and Apple Computer, Inc. This Macintosh based system was developed to meet the internal decision support requirements of Apple Computer, Inc. and is now being marketed by ExIS, a division of KPMG Peat Marwick developing Executive Information Systems (EIS). ExIS also provides other EIS tools for use on Apple computers and other workstations.

The corporate presentation "End User Computing - Where is the Payoff" presented the results of a Nolan, Norton & Co. research project focusing "end user computing". Nolan, Norton & Co. is an information technology division of KPMG Peat Marwick which undertakes research and consulting projects related to information technology in major corporations around the world. This presentation focused on the stages of development in end use computing and approaches necessary to maximizing the benefits from end user computing.

ABOUT THE FIRM

Founded in 1897, the Firm provides audit, tax and management consulting services world-wide to clients in private industry, government, higher education and the not-for-profit sector. Peat Marwick maintains more than 135 offices throughout the United States and employs almost 20,00 professional personnel.

KPMG Peat Marwick is a leader in higher education consulting. Our commitment to higher education as a separate specializing industry group dates back 25 years. Today we have over 600 college and university clients nationwide.

Our commitment to and leadership in higher education is evidenced through:

- our industry focused organization structure,
- unparalleled resources for technical support of the practice, and
- a long history of innovation, tangible contributions to the advancement of management theory and practice in higher education and the uses of technology to support the business of higher education.

ERIC

The services of our information technology practice are varied and far-reached, and include:

- Strategic Systems Planning
- Application Systems Implementation
  - Custom development
  - Reengineering current systems
  - Software package implementation

- Advanced Technology Services
  - Database management
  - Telematics

- Security and Controls Services
  - Data processing security evaluation
  - Disaster recovery planning
  - Computer auditing
  - Third-party review of data centers
  - Control for application systems evaluation

For more information about our services to colleges and universities, please contact:

Frederick J. Turk
National Director for Services to Higher Education
KPMG Peat Marwick
345 Park Avenue
New York, NY 10154
(212) 872-5848

ERIC

CONNECTING ON CAMPUS THE BASICS AND BEYOND

NOVELL'S PROGRAMS FOR HIGHER EDUCATION

Janet Perry
Manager, Higher Education Programs

The college and university market for networking is large, and growing rapidly. In recent years, institutions have made huge investments in information technology, primarily in PCs, UNIX workstations and Macintosh computers. While most college and universities have some experience with LANs at a department level, only recently have they begun to consider how to network the entire campus into one unified scheme. The choice of a network operating system to serve as the glue and background for uniting many kinds of information resources is a critical one. By using NetWare 3.1 and its add-on products, schools can create a computing environment that is responsive to the needs of actual users, while still providing services for central administrators. Novell has several programs for colleges and universities which are designed to make the process easier to administrate, easier to install and less expensive to buy.

Getting Started with NetWare

Nationally only about fifteen percent of all microcomputer on campus have been networked. Creating local area network appears to be a good idea, but colleges and universities often lack experience with technology. With a Novell starter grant, any campus, no matter what size, can obtain copies of netWare at a significant discount from list price. The number of grants available to a schools is determined by FTE enrollment. The program allows schools to learn about NetWare without making a large monetary commitment. Application forms for grants are available form local Novell offices.

Standardizing on NetWare

Many campuses have chosen to standardize on one or two network operating systems throughout the school. However, in the university environment that type of standardization requires a large number of servers. Often, it is difficult for small computing staffs to keep track of, and administrate these networks. Novell has created a multiple-copy license of NetWare that provides schools with several benefits. This license creates a centralized administration for the network, provides ways for departments and labs to get get on the network more efficiently, and has a cost advantage over the price of buying individual copies of NetWare. The Education Account Purchase program for NetWare is available to any educational institution. It is available in three versions: Advanced/SFT NetWare, and mixed SFT/386 NetWare. Schools can make additional copies of the software. Those schools which already have copies of NetWare can receive credit for them under the program.. In addition, there are multiple-copy licenses of netWare Assurance available under the program.

Student Education

Providing students with the most current technical training is an important issue for many colleges and universities. Thorough Novell's NTI Affiliate Program,higher education institutions can become certified to use Novell training in courses. NTI Affiliates may use either standard Novell training materials or can tailor courses specific to their students needs based on Novell products.

Continuing Support for Education

Novell offers its full support to colleges and universities striving to create state-of-the-art networks to serve their students, faculty, and staff better. From the Corporate Education Sales and Marketing Staff, to the local field specialists in education and Novell Authorized resellers, VARs, and OEMs, Novell is committed to helping you institution make the best use of your investment in technology.

Novell's corporate sales office is located at 280 West 10200 South, Sandy, UT 84070 (801-568-8900). There are also local offices throughout the country. To find the location of the office nearest you, please call 1-800-LANKIND.

ORACLE FOCUSES ON HIGHER EDUCATION

Oracle Corporation's Higher Education Group is staffed with experienced professionals who are committed to understanding and satisfying the special administrative, academic, and research needs of educational institutions around the country.

Oracle develops and markets and integrated and open line of software products and services for higher education information management, systems development, office automation, finance, and human resources.

CAUSE90: A Great Success

ORACLE would like to thank the hundreds of convention attendees that visited our booth at CAUSE90. We enjoyed meeting with you and appreciated the opportunity to discuss our Higher Education Program, demonstrate ORACLE products, and illustrate some of the ways colleges and universities are using our Relational Database Management System. We were very pleased with the enthusiastic response to ORACLE products and services.

ERIC

ORACLE at CAUSE90:

ORACLE's Higher Education Division demonstrated the following products at this year's CAUSE conference.

CASE: An integrated family of products that help you move from needs to solutions. These include methodology, information repository, graphic interface and application generation products.

SQL*Forms: A versatile, easy-to-learn, 4th-generation application builder that gives you the ability to create forms-based applications without programming.

SQL*Net A networking product that eliminates the boundaries between computers, so information can be moved and shared between disparate systems within heterogeneous higher education environments.

SQL*ReportWriter A comprehensive, non-procedural report generator.

ORACLE for the Macintosh

ORACLE for the Macintosh weds the power and productivity of ORACLE's Database Management System with the user-friendly interface of Hypercard. It allows users to access data on minis and mainframes through the easy Macintosh environment.

ORACLE Information

For further information about ORACLE's Higher Education Division or ORACLE's products and services please call the Higher Education Hotline: 1-800-332-7643. Within California 415-506-5120.

See you next year!

PANSOPHIC®

Pansophic Systems, Incorporated
2400 Cabot Drive
Lisle, IL 60532
708 505 6000 • Fax: 708 505 6608

CASE Division

QUESTION 1--

"Did you ask us about our University Program at the CAUSE90 Conference?"

If you did not, your university may be missing an opportunity to offer your students, at no cost to the university, the use of our comprehensive, fully-integrated Computer-Aided Software Engineering (CASE) software products in their coursework.

The University Program came about as our client-base of 15,000 sites expressed a growing need for employees with knowledge of full systems development and training on our products. Many college graduates in MIS or Business specializing in Information Systems receive the "how to" of developing information systems and the system life cycle (planning, information modeling and database design, structured analysis, design and programming, implementation, maintenance), but do not have an opportunity to use the CASE software which automates these tasks.

This is where the University Program comes into play.

Pansophic is encouraging the colleges and universities who have a CASE course offered in their curriculum to contact us and determine if we can assist you in establishing hands-on training in conjunction with the CASE course.

Our CASE product offering consists of the following:

- *TELON/Teamwork* - *automation of Information Modeling, Structured Analysis, Structured Design*
- *DB RE/generator* - *database design tool, with automated normalization, data prototyping, and generation of DB2 SQL data definition language*
- *TELON* - *the most widely-used COBOL (and PLI) code generator available on the market*
- *PAN/LCM* - *library management product*

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PANSOPHIC®
Pansophic Systems, Incorporated
2400 Cabot Drive
Lisle IL 60532-3652
708 505 6000 • Fax: 708 505 6608

For purposes of the University Program, we are offering these products and all accompanying documentation free of charge, with the stipulation that the software will be used for educational purposes only (and not for use for the university's/college's own data processing needs).

If you are interested in learning more about Pansophic's products or the University Program, please feel free to call Tom Ryan at Pansophic at 1-800-323-7335.

QUESTION 2--

"Who is Pansophic, anyway?"

Pansophic Systems, Incorporated is one of the world's largest packaged software companies with more than 70,000 installations at 15,000 mainfram, midrange and workstation sites. Our product portfolio includes:

- *CASE*
- *Application Control*
- *Information Retrieval and Control*
- *Manufacturing, Distribution and Financial Applications*

Your university may be one of the 225 educational institutions which own at least one of our products; possibly,

- *EASYTRIEVE*
- *PANVALET*
- *GENER/OL*

to name just a few.

We are a company who is committed to developing quality products that are the "best of breed" in the marketplace. The purchase of Pansophic products includes not only the software but a 24-hour Customer Service hot-line to answer any questions or problems; full documenation; and training. Our commitment to you is not just until the day of purchase, but is an on-going relationship.

For additional information, please contact Tom Ryan at Pansophic at 1-800-323-7335.

ERIC

PERIPHERAL MANUFACTURING, INC.

Memory Media Specialists

Peripherals was pleased to be a vendor at the CAUSE Conference. As a manufacturer of media products, Peripherals was given a chance to discuss the following products with many members that stopped by the booth.: ***Disk Packs, Computer Tape, Winchester Disk Drives*** and ***Tape Cleaning/Rewinding Equipment.*** *Although there may not have been ample time to visit each booth, one important subject discussed with those that stopped by was* ***Disaster Recovery*** *of* ***hard disk drives.***

For Products & Services
see next page

Peripherals also presented **DayFlo Tracker**, a powerful but flexible PC database which excels at handling text.

DayFlo Tracker is highly regarded in the University environment due to its handling of a multitude of tasks which include:

--Management of Contacts, Personnel, Vendors and Students
--Article Abstracts and Library Tasks
--Projects and Personal Information Management

***Rave Reviews in PC Journals including PC Magazine, PCWEEK, Computers In Education, Info World, etc.

DayFlo Tracker should be available in your Information Center

CALL FOR A FREE DEMO DISK

DayFlo Tracker. $195.00

PERIPHERAL MANUFACTURING, INC.
1363 Logan Ave. Costa Mesa, CA 92626
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PERIPHERAL MANUFACTURING, INC.

Memory Media Specialists

Presents

MAGNETIC COMPUTER TAPE

-New
-Remanufactured
-Archival Storage Tape
-Data Cartridges

MAGNETIC DISK PACKS

-New
-Repaired
-Remanufactured

HARD DRIVES

-New
-Repaired

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-3480 Cartridge Cleaner/Rewinder
-Cartridge Cleaner

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A Look At New Innovative Ways To Apply Voice Processing Technology In Higher Education

Dr. George W. Cole
Vice President, Marketing
Periphonics Corporation

In this paper, we explore new and traditional uses of voice processing technology applications in higher education. Four categories of voice processing technology are described: automated attendant, voice mail, audiotex and interactive voice response. The main characteristics of each category are described.

Differences among the categories of voice processing technology and applications are discussed to create a key of features to look for not only in a voice processing system, but in the supplier of the technology. Part of the voice processing vendors' responsibility is to bridge the gap between the telephone company's "language" and the host computer's "language" and to provide expertise that helps with the transition inevitable in voice processing projects.

The criteria for selecting a vendor are also suggested in this paper. The choice of a vendor depends not only on the nature of the current project (such as implementing Touch-Tone Registration) but also on the institution's plans for growth of the initial system and expansion into additional services. Examples are given to show how future plans may have serious influence on the present choice of a vendor.

This paper also discusses system configuration issues; namely, how a system should be configured, and where it should be located in relation to existing telephone and data networks. The benefits of configuring an automated voice response system with the ability to transfer callers between the system and live operators are described in detail.

Discussion of existing voice processing applications in higher education begins with a background in Touch-Tone Registration and the potentially competitive benefits of these systems on campuses across the country. Benefits can include offering a service to the student population that other geographically close campuses are not offering and a monetary benefit may be realized by the school that charges a nominal fee to students for the privilege of using Touch-Tone Registration.

The history and continued growth of interactive voice processing technology is unique in the higher education market in that users of the technology have willingly shared experiences and knowledge with other institutions. The spread of the technology in higher education has been stronger and faster than in any other single market primarily due to this sharing of information. The rest of the paper concentrates on additional applications that will keep this growth going.

Examples of the following value-added applications for voice processing technology in higher education are given: encumbrance releases, bulletin boards, admissions and application procedures, financial aid status, transcript requests, and meal plan selection.

Attention is given to searching out new and innovative ways to look at potential users (beyond students). Orders can be taken from the book store. Alumni can be kept up to date on campus matters or sports scores. Audiotex is a natural way to disseminate health and safety information to the community. Faculty and staff could order supplies or enter repair requests. Maintenance staff could increase their efficiency in keeping up with job orders and job completion.

Caller message recording and facsimile transmission/integration are two relatively new features of interactive voice response systems. A description of these features as well as suggested possible applications are given.

Beyond new features like caller message recording the paper emphasizes application development issues. The transaction processing environment on your voice system should be flexible, and it should allow on-line changes while the system is running. Systems should include software development and test tools that are suitable for 1990s level of programmer productivity. The voice processing system should not interfere with the host system's database management - it is a peripheral that is accessing the database and not the database manager.

The paper concludes with a brief discussion of menu-driven fourth generation languages vs. procedural programming.

Complimentary copies of the paper as well as a hard copy of the slides are available from Periphonics Corporation. Contact Barbara Schechter at 516-467-0500.

Focus on CAUSE90

Quodata

CAUSE90, in warm Miami Beach, was a big success and Quodata is proud to have been there. Many CAUSE members saw a demonstration of our new, sophisticated Degree Audit - Academic Advising software. Conference attendees also appreciated viewing the next generation of screen management facilities built on DECforms, with DECwindows to follow.

□ The Company

Quodata was founded in 1971 to provide the finest computer software and service to educational institutions. The company focuses on higher education with an array of administrative software systems which give users great flexibility.

Quodata joined resources with Digital Equipment Corporation in 1971 to provide administrators with the benefit of Quodata's expertise in software and services plus Digital's leadership in technology. Quodata was Digital's first Systems Cooperative Marketing Program (SCMP) member for administrative systems in education.

□ The Software

Quodata is one of the first companies to make a major investment in following industry standards. Today Quodata can demonstrate an array of integrated products running on a relational platform. This architecture includes not only a relational database, but also a structure in which extensive changes can be made to an application system without modifying the source programs. Quodata's software family of integated products includes:

- admissions and recruitment
- billing and accounts receivable
- financial aid
- financial reporting
- institutional advancement
- payroll and personnel
- student information and degree audit

These products are all built with the same flexiblity and integrated database structures. Changes to a wide variety of control files, collectively called libraries, make these systems extremely versatile. Users are free to change table values; add data elements, files, new logical views, or even entire databases; create or modify menus, video screens, reports, and command procedures: and even create new relationships between existing or new databases.

One very important benefit of this structure is that a new version of the software does not override changes to the existing version. Generally only a minor effort is necessary to add enhancements to the tailored libraries. No other software handles updates as easily as Quodata's new relational software architecture; it is designed for change.

Quodata's software architecture adheres to to Digital's VAX/VMS operating systems architecture and Networked Application Support (NAS) software standards, which Digital exhibited at CAUSE90. Quodata believes that no one software company can fill all the administrative needs in higher education, and that a standard software platform simplifies access to other products and personal workstations. Quodata's software functions well within a distributed network, multi-platform environment.

□ The Services

Even the best software is of little value without the right support. Quodata takes great pride in providing excellent service. Proof of its quality is the 93 percent software service contract renewal rate for Quodata clients over the past six years. The most important commitment is to the hiring of capable, service-oriented people with experience in educational institutions. Client services is the company's largest department.

Most clients move from an existing computer system to the Quodata system. Sometimes there are features users have or want which are not part of the standard system. The flexibility of Quodata software means that making these modifications is unusually easy, *without programming*. However, someone must analyze the situation, determine the best way to effect the change, and modify the paramaters in question. Many clients have computer staffs capable of doing such work, but their time may not be available. Other institutions have only minimal computer staff. Quodata offers such users additional implementation options. Essentially, Quodata personnel will perform many of the tasks necessary to get the institution up and running.

□ The Users Group

A great deal can be learned by sharing information with peers at meetings like CAUSE90. Quodata actively supports and encourages its user groups. An annual conference is held each Fall. Sharing is further promoted regionally and through newsletters.

SCT Caps BANNER Year With Major Announcements at CAUSE90

Systems & Computer Technology Corp. (SCT) concluded a year of significant advancements for its **BANNER®** Series of administrative software systems with several major announcements and product introductions at the CAUSE90 conference in Miami Beach.

New Relationships

On November 28, SCT and Digital Equipment Corp. announced an agreement to jointly market BANNER for higher education on Digital computer systems. The agreement is part of Digital's Cooperative Marketing Program (CMP).

"We are proud to be Digital's newest partner in higher education," said Michael D. Chamberlain, SCT senior vice president of software and technology services. "We expect the synergy between our companies will enable us to develop and implement the right administrative solutions for our mutual clients."

Also during the conference, SCT and Natural Language, Inc. (NLI), of Berkeley, Calif., announced that they were working together to provide a plain English access query tool for the BANNER Series. NLI is a leading provider of database tools that enable end users to access and analyze relational database management systems in English.

SCT is a member of NLI's Value-Added Reseller Program. Under that program, SCT customized NLI's Natural Language product to create **IntelliQuest™**, an English language querying tool for BANNER.

IntelliQuest

IntelliQuest, which SCT unveiled and demonstrated at CAUSE90, is a powerful executive tool that makes access to strategic information as easy as asking a question. Complex inquiries to the BANNER administrative database can be initiated with plain English commands that require no technical knowledge.

For example, the dean of a mathematics department could ask: "How many students earned an A in math in the fall of 90?" and have the answer in a matter of moments. Or a vice president of academic affairs could type in: "Compare the average GPA of the College of Arts & Sciences with the average GPA of the College of Education," and receive the comparison within seconds.

IntelliQuest breaks the barriers between users and their administrative databases because it understands English as we speak it. With NLI's reasoning-based technology, IntelliQuest can interpret grammar, understand misspelled words

and learn from the information that is entered. In short, it allows executives to easily communicate with an administrative system for the first time, placing the entire range of data at their fingertips with no special training or data processing involvement.

With IntelliQuest and any BANNER system, data can be accessed, organized and presented simply by asking. At the institutional level, a broad spectrum of information can be analyzed to support strategic decisions. At the departmental level, users can provide a student transcript, analyze job applicants, target the best donors, or track adherence to budget guidelines. The answers can be received in plain English, or in the form of charts or graphs.

New BANNER Systems

The latest additions to SCT's BANNER Series -- Financial Aid and Human Resources systems -- were also highlighted at CAUSE90.

The Human Resources System delivers the information that administrators need to better control their personnel costs, which typically represent their largest single expenditure. The system supports the full range of functions that are necessary for human resource administration, including budget preparation and monitoring, position control and staffing, applicant processing, EEO reporting, W-2 reporting, assignment processing, benefits administration and payroll processing.

BANNER Financial Aid establishes a new standard for financial aid information and management systems. The system enables financial aid administrators to effectively manage the business of their daily operations. Functions such as tracking, budgeting, need analysis and packaging are easily accomplished, improving services to students and increasing staff time for student/parent counseling.

These systems join the Student, Finance and Alumni/Development systems to form a comprehensive, integrated administrative product line.

CAUSE/EFFECT "Contributor of the Year" Award

For the ninth consecutive year, SCT sponsored the CAUSE/EFFECT "Contributor of the Year" award, presented to the author of the article judged to be the best of all the contributed papers published in the quarterly magazine during the prior year.

The award-winning article, "The Decentralization of Academic Computing: Defining Future Roles," was written by William J. Kettinger, who is Assistant Dean for Information and Technology Resources at the College of Business Administration of the University of South Carolina.

For more information about the BANNER Series, IntelliQuest or SCT's other innovative products and services for higher education, please call our toll-free number, or contact:

Systems & Computer Technology Corp.
4 Country View Road
Malvern, PA 19355
Call toll-free: 800/223-7036
In Pa., call: 215/647-5930

BANNER is a registered trademark, and IntelliQuest is a trademark, of Systems & Computer Technology Corp. Natural Language is a trademark of Natural Language Inc.

SSH!!!

The System For Student Housing

Announcing the Scantron/SofTech Strategic Alliance

SofTech Associates has entered into an agreement with Scantron, Inc. to develop software interfaces between SSH!!! and Scantron's Optical Mark Reader devices in order to eliminate most labor-intensive data entry tasks.

Initial work shall focus on room inspections, work order completion, incoming student applications and resident room assignments.

"We hope to be working with a number of schools this fall to complete a fully operational prototype by this November", stated John Caruana, SofTech's President and author of SSH!!! "Scantron has been very helpful in providing our staff with the necessary hardware, software and forms to create the prototype. I think a lot of schools will be interested in the application of this proven technology to data entry problems specifically related to college housing operations."

Mr. Caruana envisions the utilization of SSH!!!'s existing function keys to access the proper scanning software from directly within SSH!!! menus and programs. This will create a situation whereby the scanning operation and upload of the scanned data will be invisible to the end user.

By taking advantage of Scantron's tried and tested technology, SofTech will be able to offer more powerful and cost effective solutions to specific data entry tasks than will its competitor's proposed system of expensive, portable computers.

Pilot Program In The Works...

On July 15, 1990 SofTech announced the start of its first multi-school development effort. The project will focus on the implementation of the new strategic alliance between SofTech and the Scantron Corporation by integrating optical mark reader devices into three existing areas of The System For Student Housing's data entry procedures.

Incoming student application, resident student lotteries and assignments and work order completion tasks will be available in current manual entry mode or as optional scanned input. Also, a new Room Inspection Subsystem will be developed around the Scantron devices to automate inspections and reporting. Inexpensive optical mark forms will replace cumbersome paperwork and eliminate the need for costly portable data entry computers.

Included within the room inspection procedures will be direct links to current SSH!!! programming enabling the user to create AUTOMATIC work orders and optional damages pre-billing reports that will enable housing managers to receive instant information on room, building and total system status.

Initial estimates put manpower time savings in the 50% to 80% range while the intelligence of the scanner and interface will virtually eliminate the possibility of data entry errors. The new Room Inspection Subsystem will enable a typical school with 1,000 rooms and 15 inspectors to complete this task in about one day and place complete reports on a manager's desk within one hour of inspection completion.

A maximum of six (6) schools will be eligible to participate in this pilot program. These schools will be offered the following benefits:

- The use of a FREE Scantron Model 8000 or 8200 scanner for the spring semester if funds are not currently available. This will include delivery and installation by Scantron personnel and instruction from SofTech's staff of trainers.
- The application of educational discount rates to the purchase of the scanner after the completion of the program.
- FREE forms design and preparation by Scantron when a common generic form is decided upon for each area of data entry. Schools will be required to purchase actual printed forms at 5m, 10m and 20m quantity discounts.
- 30% to 60% discounts on software interfaces from SofTech PLUS a 30% discount in SofTech's programming rate for software customization.

Design work for the pilot program will take place this fall with pilot unit installation slated for this winter. SofTech expects to have all schools go live with the Scantron interface in time for the January/February admissions season. If your school is interested in becoming a part of this exciting program, call SofTech now!!!

Copyright (c) 1990 SofTech Associates, Inc., 19 Revere Road, Suite 1B, Piscataway, NJ 08854 201/463-0403

Across the Campus or Across the State, We Can Help You Manage Information Better

Reach New Heights in Information Processing

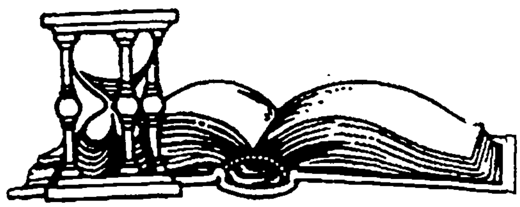
SOFTWARE AG, one of the world's largest independent software companies, has the ideal tools to satisfy your academic and administrative information needs. NATURAL is the most widely used fourth-generation technology in the world. ADABAS offers database management system performance like you've never seen before. PREDICT is the central repository that provides peace-of-mind control. Together with SOFTWARE AG's commitment to higher education, these technologies produce solutions that are efficient, productive, and cost-effective.

Seeing was Believing at CAUSE 90

During 1990, we redeveloped and delivered Information Associates' Financial Records System, Purchasing System, and Fixed Assets System in NATURAL 2 running under ADABAS. These packages were demonstrated at CAUSE 90.

At the conference, we showed how the IA Financial Records System lets you:

- Manage payables
- Administer grants and contracts
- Meet institutional reporting requirements
- Handle year-end processing
- Control budgets, requisitions, and encumbrances
- Create and track purchase orders, and
- Monitor and manage vendor relations.



We also demonstrated how the IA Purchasing System can help you:

- Increase buyer productivity
- Reduce administrative costs
- Create a comprehensive vendor database
- Track commodities
- Process requisitions
- Solicit bids
- Award purchase orders
- Accept delivery, and
- Monitor vendor invoices.

Those at CAUSE 90 also saw that the IA Fixed Assets System allowed them to:

- Provide detailed support of property records
- Research complete cost and/or valuation records

- Assign custodial responsibility for assets
- Access current, accurate administrative/management data
- Calculate and record depreciation charges, and
- Generate replacement cost and risk management information.

All financial system functions have full on-line query capabilities, are completely integrated, and are available for delivery now.

We're as Flexible as our Technology

With NATURAL and ADABAS, you make the choice:

- Purchase applications
- Build applications, or
- Work with SOFTWARE AG Professional Services to develop customized solutions.

At CAUSE 90, we demonstrated some of the systems that universities and colleges had created with our technology including a Communications Trouble Resolution System, a Policy and Procedures Manual Retrieval System, and the Apple Macintosh front-end to a library system.

SOFTWARE AG is working with more than 100 higher education institutions right now—each with its own unique requirements. Washington State University, University of Texas—Austin, Penn State University, University of Delaware, and Indiana University of Pennsylvania are only a few of the colleges and universities who turn to SOFTWARE AG.

For more information regarding our higher education commitment, products, or services, please call toll free 1-800-843-9534 or 716-586-5104 today.

software AG
Solutions Worldwide

SOFTWARE AG of North America, Inc.
11190 Sunrise Valley Drive
Reston, Virginia 22091
703-860-5050

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STERLING SOFTWARE
Dylakor Division

"Where Ideas Become Information Management Solutions"™

Sterling Software's Dylakor Division extends hearty congratulations to the CAUSE organization on a spectacular showing at the CAUSE90 conference in Miami Beach in November 1990. Our thanks go out to hundreds of CAUSE90 attendees who dropped by Dylakor's booth to visit with our representatives. Dylakor appreciated having the opportunity to discuss the valuable contribution our products can make toward the success of IS in higher education. We were particularly pleased at being able to demonstrate the two Dylakor products which highlighted our exhibit: DYL-IQ *Express*® and DYL-280 II *Relational*.™

Serving Higher Education For Over Twenty Years

For over twenty years, the Dylakor Division has devoted considerable time and resources cultivating solid relationships with information systems organizations at higher education institutions. During this time, Dylakor has gained valuable insight into the special needs of this marketplace in meeting its mission of supporting higher education. By staying well-informed and sensitive to the issues impacting the management of information systems at colleges and universities, Dylakor has managed to increase its presence in the education sector.

New Challenges in the 90s

As we begin the 1990s, there is a new set of challenges for all IS professionals, while those working in the field of higher education have a number of unique concerns. Competition for students has grown fierce with declining enrollments just as state governments, the crucial source of funds for many CAUSE members, have begun to draw the purse strings tight.

Dylakor can make a difference by providing your user community with tools they can use every day to achieve remarkable productivity gains. Dylakor's software systems are ideal for performing a broad array of tasks critical to the daily operation of your information systems applications, including program development, report generation, querying, data analysis, system maintenance, information processing, testing and debugging and high volume production applications.

If increasing productivity tops your list of priorities, now is the time to take a look at the efficiency of operation Dylakor's software solutions can make possible for you.

ERIC

DYL-IQ *Express*®

As every IS professional knows, fast and efficient retrieval of information residing in various forms on a mainframe presents a formidable challenge. This requires a product that can selectively provide data, in almost any format, to almost any destination. And that is precisely what DYL-IQ *Express* delivers.

DYL-IQ *Express* is an interactive, online query and reporting system that provides direct access to a user's production mainframe data and delivers it promptly to either a mainframe terminal or personal computer.

DYL-IQ *Express* is easy to learn and use. With just a few menus, users can pinpoint and retrieve exactly the data they wish to access and on which to report. And the system does its job fast and efficiently, delivering the information to the user in an online, interactive mode. DYL-IQ *Express* is also extremely versatile in that it transparently provides simultaneous access to any combination of DB2, IMS/DB and VSAM (KSDS, RRDS, ESDS) data.

DYL-IQ *Express* operates in all MVS teleprocessing environments, including CICS, IMS/DC, TSO and batch.

DYL-280 II *Relational*™

DYL-280 II *Relational* is a comprehensive information management and report generation system for IBM mainframe environments. Report generation, information processing such as file or table creation and maintenance, and other vital functions become simple, direct and efficient with this indispensable data processing tool. While greatly increasing productivity with IBM's DB2 and SQL/DS or Teradata's DBC/1012, DYL-280 II *Relational* has the added benefit of accessing and processing other database and/or file types.

DYL-280 II *Relational* uses a simple, English-like language that combines with SQL to form an incredibly efficient syntax. When compared with COBOL, the number of lines needed for a given procedure is reduced by an average of 50%. Moreover, because DYL-280 II *Relational* utilizes the user's existing COBOL data definitions, there is never any need for continually rewriting file and field definitions.

DYL-280 II *Relational* operates under MVS/SP/XA/ESA, VSE/SP, and VM/CMS; and optionally under these online environments: CICS/MVS, TSO, and CICS/VSE.

For more information on DYL-IQ *Express*,
DYL-280 II *Relational* or any of Dylakor's other quality products,
please write to the Education Accounts Manager at
Sterling Software, Dylakor Division,
9340 Owensmouth Avenue, Chatsworth, CA 91311
or call 818/718-8877.

Dylakor, DYL, and DYL-280 II *Relational* are trademarks or registered trademarks of Dylakor, Inc.

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Partners

We are pleased to again take part in the annual CAUSE conference. It's a great way to see old friends and to meet new ones, as well as to showcase what is fast becoming our signature product -- the 4400 Automated Cartridge System (ACS) library. The past year has been an especially gratifying one for us since it marked the sale of StorageTek's 2000th library.

This fully automated, cartridge-based information storage and retrieval product fills the void between existing online and offline systems by creating a revolutionary Nearline (TM) system. Unique to the 4400 ACS, Nearline stores data at a fraction of the cost per megabyte of online storage ... yet its quick, consistent response time places it much closer to DASD for fast performance.

The 4400 ACS automatically mounts and demounts up to 6,000 18-track cartridges on the StorageTek 4480 subsystem. The advanced robotics retrieves and delivers the cartridges in seconds, stores data at less than 50 cents per megabyte purchased, and has an efficient footprint 30- to 70-percent smaller than that of comparable manual systems. And that's not all. The 4400 ACS allows compatibility and connectivity with a majority of the world's major mainframe systems including Bull, Convex, Cray Research, Digital Equipment Corp., Fujitsu, IBM, Siemens/Nixdorf, Unisys and UNIX.

But the 4400 ACS is just one example of StorageTek's innovative spirit and customer responsiveness. Since our inception in 1969, we have become a world leader in the design, manufacture and marketing of four basic product lines — solid state disk, rotating magnetic disk, tape, and printers. In addition, we provide the supporting software and service for these products. Approximately 9,300 people are working hard for you at our Colorado headquarters and at more than 130 sales and service locations worldwide.

At StorageTek, we believe in partnerships. Jacque Byrne, our public sector marketing representative, can tell you how a partnership with StorageTek can make a difference in your data center. Call her today at (303) 673-6550.

StorageTek.

Storage Technology Corporation • 2270 South 88th Street • Louisville, Colorado 80028-4338

Sun Microsystems, Inc.

Sun Microsystems, Inc. was pleased to have had the opportunity to demonstrate superior administrative solutions such as SCT's BANNER series, USC's TOADS software, Sun Microsystems' CDware, Informix WINGZ, and the Robinson Group along with library solutions such as Carlyle Systems on the Sun platform. Along with our participation in the exhibit area, we hosted a hospitality suite and sponsored a presentation track on "Sun and It's Technology Partners for Administrative and Library Computing."

Sun's Partnership with Education

Sun Microsystems is the leading supplier of network–based workgroup computing systems, including workstations, servers and UNIX software, and the company's committment to the education market is exemplified by its product line and education programs.

Through Sun's education and research marketing organization in Mountain View, California, the company maintains close connections to its roots at leading universities, research sites, and scientific organizations. Sun's partnerships with academic institutions from around the world have produced technical innovations that have proved beneficial to the education community, Sun, and all individuals who use Sun's technology. We strive to enhance this relationship while we grow beyond research computing—where new insights are created, to administrative computing, where we assist the university in running the business of education, and onto instructional computing where current knowledge is mixed with new insights and actively explored by open minds.

The greatest challenge facing any campus computing administrator today is providing the most comprehensive yet cost effective access to information to the campus community. The solutions must address the individual user—faculty, staff, researcher, as well as the departments—from Anthropology to Zoology, and all types of users—personal productivity to instruction to research. The relationships between users are many.

Sun can provide the broad range of systems, software products and services to address these requirements. Sun was the first major computer company to invest in adopting industry standards—and where absent, developed them ourselves—to best protect the investment of the users. This is an important advantage for the campus whose resources to maintain such systems are often already overtaxed.

Sun systems are currently installed in over 1000 university campuses and 250 different departments worldwide. Though initially considered a "technical workstation" company for compute-intensive disciplines only, Sun has made its way into other departments and other areas of campus. Suns are being installed in the library and in campus administration traditionally for student records and grades. Additionally, because of the availability of discipline-specific software, Suns are used in such diverse departments as Business Administration, Journalism, Earth Resources and Anthropology. Sun is actively working with both commercial and university software developers to provide the computing solutions required on campus.

With these thoughts in mind we will move forward to continue to build strong partnerships with the education community with the knowledge that these contributions will bring rewards to all.

sun
microsystems

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The AIMS Group

We're Setting Academic Standards.

The AIMS Group announces new Customer Education Program

AIMS available on DEC Risc Family of Processors

At a delightful dessert reception, The AIMS Group enjoyed meeting and talking with CAUSE '90 participants. In-depth discussions continued at The AIMS Group booth which featured the entire AIMS System operating on a Hewlett-Packard Series 9000 machine. The AIMS System addresses all facets of the administrative management needs of colleges and universities. Through this participation at CAUSE '90 for the t. .d consecutive year, we hope to demonstrate our exclusive commitment to Higher Education and to CAUSE.

AIMS Customer Education Program

1990 saw the addition of a Customer Education Center to The AIMS Group Florida headquarters. Class offerings address the needs of application and technical users with a wide variety of beginning and advanced courses available. Classes combine lecture, student workgroups, and "hand-on" workshop exercises.

DEC Risc Family of Processors

CAUSE '90 also saw the introduction of the popular AIMS System on the DEC Risc Family of Processors. This new implementation has the same distinctive user-friendly functionality of the original AIMS package. AIMS is now available on Hewlett-Packard, Digital Equipment and Prime Computers.

We look forward to seeing all our friends and making new ones at CAUSE '91 in Anaheim, California next November!

The AIMS Group, Inc.
6501 Park of Commerce Blvd., Suite 220
Boca Raton, Florida 33487
(407)994-0982 800-444-AIMS

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The Robinson Group Ltd.
Information Access is Our Business

THE ROBINSON GROUP, LTD., PREMIERS AT CAUSE '90

At the opening of the CAUSE Corporate Demonstration Area on Wednesday morning, **The Robinson Group, Ltd. (TRG)** was celebrating their debut. With the brightly colored balloons, streamers, jelly beans, and employees dressed in the company's corporate colors, The Robinson Group booth could not be missed.

This same enthusiasm continued with the hospitality suite that evening. The Western theme denoted TRG's Phoenix location, neck scarves in cranberry and purple were worn by all; and literature about the wild, wild west and the TRG and Maricopa Round-Up on April 18 & 19 were presented.

At noon on Thursday, The Robinson Group announced that Elliott J. Haugen, Associate Vice President for Computing and Information Systems, from St. Louis University won the drawing for a free trip to Phoenix for the TRG and Maricopa Round-Up and a helicopter ride over the spectacular Grand Canyon.

Information Access is The Robinson Groups business. Demonstrations illustrated software that gives access to information, to students, faculty and administrators. The specific products featured are briefly described below:

The **Campus Information System**, presented on a kiosk, displays relevant information from administrative systems and external sources of information. For example, a visitor can review a map to find their way around campus; a student can examine student services available and specific information about themselves; and a casual user can inquire about college-related information from conveniently located displays.

The **Faculty Support System** is an instructional record keeping system for faculty. It uses a relational database and 4GL that can run on a mainframe or workstation and is accessible from a terminal, MAC or MSDOS desktop equipment. This system accesses student related data from your Student Information System and allows faculty to communicate electronically with their students.

The **Student Tracking System**, a relational database and 4GL system, collects, manages, monitors and appropriately distributes information regarding students progress in achieving educational goals from kindergarten through postsecondary education. This system is being used as the catalyst for uniting educational institutions in a community, statewide and regional effort to address the educational needs of students.

2411 West 14th Street Tempe. Arizona 85281 6942 USA Fax: 1 602 921 9406 Telephone: 1 602 784 4870

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The **Curriculum Management System**, is a system that manages the curriculum development, review, approval and update process. It was developed using a 4GL, relational database and is interfaced to a degree audit system.

The **Administrators Almanac** is the collection of data over time that is summarized and presented in spreadsheet and graphic form with annotation capability. This almanac summarizes the data from your administrative systems and also has the capability to incorporate external data for comparison with institutional data. It can be run on a mainframe or workstation and is accessible from a MAC or MSDOS machine.

The **Fact Finder** is an English query tool that accesses data from your administrative systems. It has the capability for a 10,000 word vocabulary and 100 concepts. This tool gives administrators a quick way to answer specific questions. The tool has been incorporated into the Student Tracking System and has been interfaced to a Student Information System.

Wang Laboratories, founded by late Dr. An Wang, a renowned scientist and an innovator, is headquartered at Lowell. Massachusetts. With a broad base of customers, over 55,000 in 130 countries around the world, Wang has revitalized its product line by providing "customer-driven" applications on industry compliant OPEN/Architecture with Innovation On Standards.

Wang is your competitive source for a variety of systems and applications:

- PCs - Fully compatible IBM PC-AT and PS2 systems,
- Industry Standard PC software, printers and accessories,
- Banyan VINES and Novell PC LANS, Wide Area Networks,
- Automated Telephone Answering/ Data Access/ FAX Forwarding Systems,
- Integrated Image Systems and Imaging Applications,
- Business Process Automation Systems, Consulting Services,
- Software Applications for Education, Government, Manufacturing, Distribution, Retail, Legal, Finance, Professional Services and Insurance,
- VS and UNIX Servers integrated into Industry Standard LANs and Wide Area Networks.

Wang In Education

Wang has a large number of installations in colleges, universities and other educational institutions in the U.S. as well as around the world; from minicomputers and networks to PCs, and, from Voice to Imaging systems. Currently, our focus is on the Administrative Computing solutions in Higher Education.

Wang's Student Admissions Imaging System at the University Of Southern California (USC), for example, represents our true commitment to "customer-driven" approach. Designed and implemented in conjunction with USC, the application processes and manages student admissions documents with speed and efficiency in the form of high resolution images on magnetic and optical media. This has enabled USC to cut its processing time into half. USC saves hundreds of thousands of dollars in operating costs by reducing paperwork, filing operations and floor space, and, by increasing employee morale.

Wang's Higher Education marketing partners complement such solutions to provide the customers with a wide range of Student Enrollment Services such as Registration by Voice over telephone lines, Financial Aid, Student Athletes Tracking with NCAA Compliance, and, Alumni and Gifts Tracking to name a few.

Wang At CAUSE 1990

Wang sponsored and participated in several events at CAUSE 1990 at Miami Beach, Florida, including the following:

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- o Exhibit booth featuring "Student Admissions Imaging" application based on the USC's admissions installation, and, complementary Enrollment Services from Wang's partners;
- o Pre-conference seminar, "Imaging and Education For The 1990's", by Tom Myers, Dir. Of Information Systems and Research at USC;
- o Breakout Session, "Campus Imaging- Wang In Education", by Vijay Masurkar, Government Applications Engineering/ Education, Wang Laboratories, Inc.;
- o Hospitality Suite.

Operation Customer

The cornerstone of the new Wang strategy is "Operation Customer"; a worldwide program built around the principle that our business exists solely to provide the highest quality products and services to customers. Education as well as other customers can expect this from Wang-

- o A partnership with Wang,
- o Participation in a joint venture such as marketing or product development,
- o A field organization that understands your business, and,
- o A total commitment to quality.

An OPEN Commitment

The structure for the business solutions, Wang's OPEN/Architecture framework, responds to customers' needs by building on the technical prowess and craftsmanship that have been the hallmarks of the Company's products since it shipped the first calculator. The strategy embraces all levels of platforms in multivendor environments and delivers systems that integrate the four basic forms of information- data, text, voice, and image.

OPEN/Architecture provides the "road map" for the 1990's, said Thomas H. Wilmott of the Aberdeen Group, a Boston consulting firm. "Wang has the engineering talent to make the technology a reality for you in the 1990's", he told users in his keynote address at a major conference this year.

Wang is a Corporate CAUSE Member. For general information, contact your local Wang office, or, write to:

Vijay Masurkar
Wang Laboratories, Inc.,
Program Manager Education,
1 Industrial Avenue, MS:014-890,
Lowell, Ma. 01851.

For "Student Admissions Imaging" product information, call Wang at: (508)967-4124.

XEROX The Document Company

Xerox Corporation was pleased to participate as a corporate member for the first time this year in the CAUSE'90 National Conference. We are looking forward to strengthening our relationship with the higher education community in the decade of the Nineties, as we deliver products and services which serve your document-related needs.

Xerox was honored to participate in this year's conference in several different ways:

- ***Hospitality Suite***--We took advantage of this forum to invite CAUSE members for an "evening at the movies", complete with popcorn, snacks and beverages. The "star" of our performance, shown in a 15 minute video followed by questions and answers, was the new *Xerox DocuTech Publisher Series*, which had been announced to the marketplace only a month before. The video described the new system and, more importantly, its anticipated role in the university environment.

- ***Product Information Booth***--Xerox provided a booth in the Corporate Demonstration Area, to furnish product literature about *DocuTech* and answer specific questions from visitors about this exciting new capability. Since *DocuTech*, a high end digital duplicating system, is designed for networked input of PostScript files in addition to taking hardcopy input directly, it naturally is sparking considerable interest among information technology professionals. We plan to have *DocuTech* at the CAUSE'91 conference for attendees to see this revolutionary system firsthand.

- ***CAUSE Central***--At the request of the CAUSE'90 conference organizers, Xerox was delighted to assist in providing participants with access to office support services. We furnished a midrange copier with online stapling capability, which produced "more than a few" copies during several busy days at the Fontainebleau. As a pioneer in "fax", we are pleased to see the broad market acceptance of this indispensable technology. One of our new facsimile devices was on duty and in use for anyone needing document communication with their office while in Miami Beach.

- ***Coffee Break***--We were pleased to co-host one of the breaks on Friday morning.

For additional information about Xerox products, contact your local Xerox Sales Representative, or write to:

R. Glenn Alexander
Segment Marketing Manager, Universities
Xerox Corporation
295 Woodcliff Drive, Bldg. 817-02A
Fairport, NY 14450

CAUSE90
MIAMI BEACH
NOVEMBER 27-30, 1990

A PICTORIAL REVIEW OF CAUSE90

In spite of widespread travel restrictions and tight budgets, CAUSE90 drew another record crowd of more than 1,300 professionals involved in management of information technology resources of higher education institutions across the country and abroad. The pictures on the following pages are presented as a reminder to these participants of the variety of good times and opportunities for professional growth last November at the Fontainebleau Hilton on Miami Beach.

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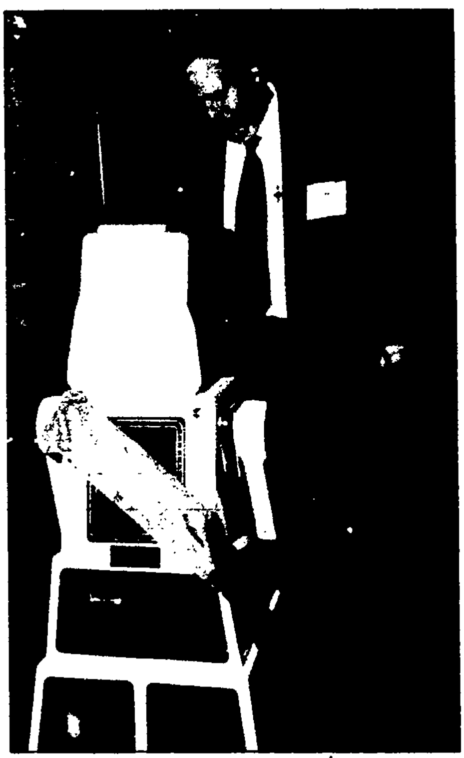
Corporate participation ...



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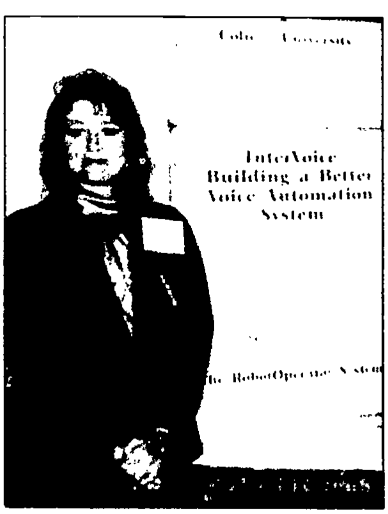

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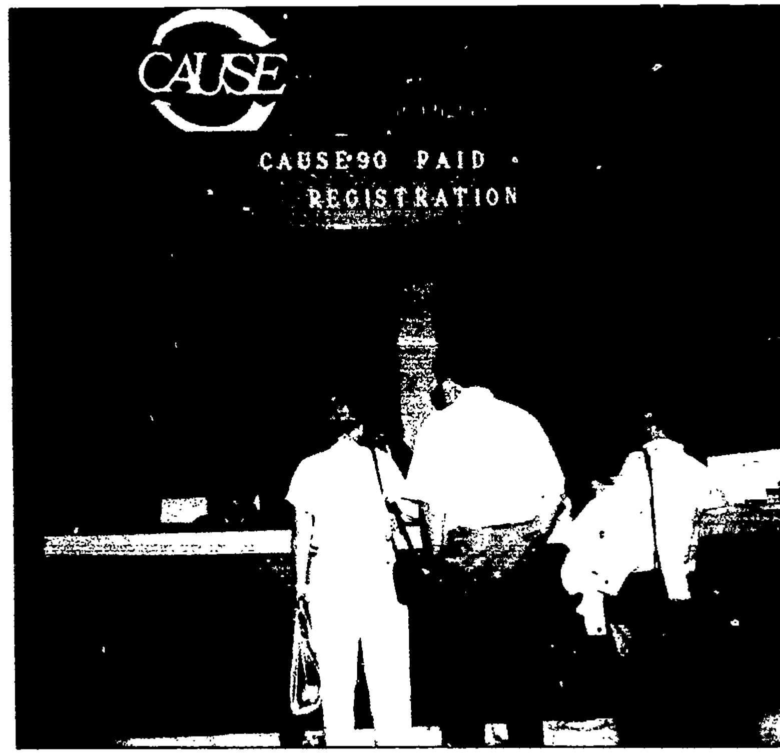
Formal program



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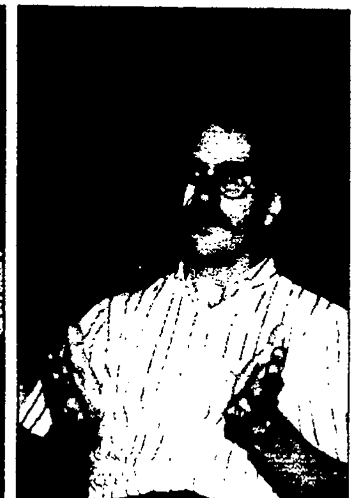

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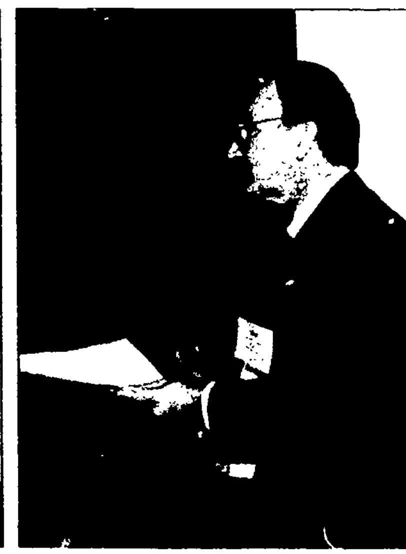
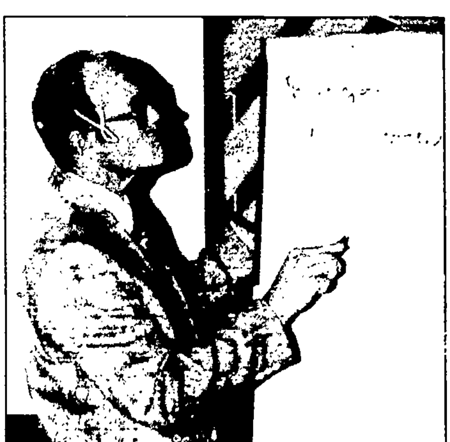
in session ...





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and out ...

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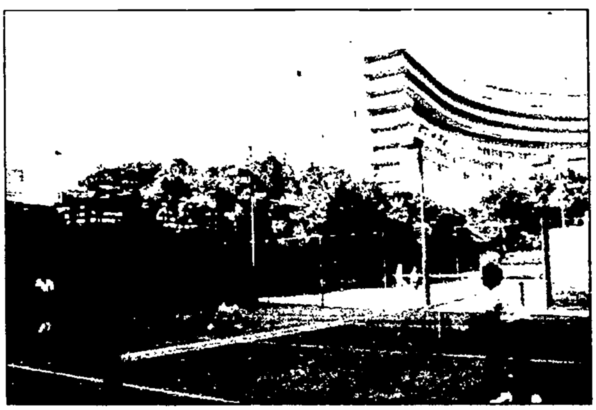
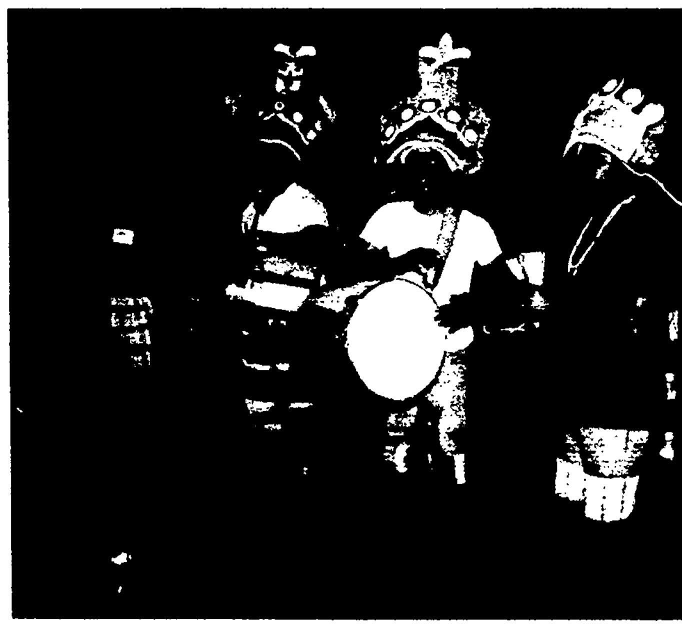
and time for socializing ...





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CAUSE90 Conference Evaluation Summary

227 evaluations received for an **overall conference evaluation** of **2.4**
based on a scale of 1 to 3: 3 = High value, 2 = Moderate, 1 = Low

Rate the following CAUSE90 activities in terms of their value to you:

	High	Moderate	Low	NO opinion	Did not attend	Average
General sessions	155	62	03	01	02	2.7
Track sessions	114	100	07	0	01	2.5
Current issues forum	43	65	15	12	55	2.2
Current issues sessions	57	63	15	09	44	2.3
Constituent groups	56	62	21	08	53	2.3
Special interest groups	45	44	12	08	77	2.3
Ask the experts	44	51	08	07	82	2.3
Round tables	32	42	14	09	95	2.2
Communications central	81	38	21	21	34	2.4
Corporate hospitality suites	92	82	25	01	15	2.3
Corporate presentations	59	104	25	02	22	2.2
Corporate demonstrations	86	96	19	01	12	2.3
Opportunity to talk w/colleagues	190	04	01	01	01	2.9
Other (see comments following)						2.5

Comments:

Excellent job! Organized! Very worthwhile! Best CAUSE ever! (11)
Not enough seating for informal meetings, need lounges in the halls. (5)
Several speakers of the Track sessions did not address issues in abstracts; too general, too vague, too few specifics, too few answers & solutions. (4)
Wetherbe was wonderful! Speakers of general sessions were excellent. (3)
Conference may be reaching saturation in terms of variety of sessions, etc. (3)
Need more specific ways to meet other attendees. (3)
Thursday lunch too long. (3)
CAUSENET is better (3) but still slow, up and down.
Session lengths were optimal for track sessions (2)
Information & registration booths were great.
Opportunity to talk w/colleagues informally was the best & most important part of conference!
I liked the large letters for first names on name badges
Quality of presentations was overall excellent and highly relevant.
There was not enough time for Round Table Discussions
The Round Tables were conducted as panel discussions so the opportunity for real discussion was not present.
Moderators should do less speaking.
Appreciated objectivity of corporate speakers—no sales pitches.
Breakfasts ran out of food too soon.
Have an entertaining high input personality to introduce CAUSE leaders at the Thursday lunch recognition.
Providing written presentation for overflow sessions as for Penrod's talk was helpful.
Current issues sessions might be a more informal environment.

Did you learn anything at this session that might affect the way you do things at your campus?

206 yes (91%) / **11** no (5%) / **3** maybe (1%) / **7** no answer (3%)

If yes or maybe, please explain:

New strategies, plans, ideas, perspectives, approaches, concepts, key information (53)
Better handle on direction for short and long term planning (15)
Learning what others are doing, exchanging information, support (12)
Renewal of determination, confidence, motivation (8)
Planning: disaster recovery, policy, strategic, successful and adapting to change (8)
More time for Corporate Demo area (7)
Personnel skills, management, motivation (5)
User interface, customer service (5)
Approaches to networking, productivity, re-engineering, client/server architecture (5)
More effective use of software (4) hardware
Networking campus application into 21st century (4)
Small college track <2,000 FTE (3)
IT Planning; connectivity; decision-support systems (3)
Partnerships: inter-disciplinary, hardware/software vendors, multi-campus (3)
Outsourcing (2)
Collaboration planning (2)
Anytime, anyplace, anyway (2)
Multi-media technology alternatives (2)
Security & authentication, and data integrity (2)
Wetherbe's notion of scorekeeping
Yes, but much less than I hoped and significantly less than last year
Payroll backup
ISDN, cost cutting options
MIT documentation seminar
Universal ID card

What topics would you like to hear at future conferences?

Budget cuts & downsizing in a broader scope, allocating resources, cost effectiveness (9)
IT educators, practitioners, services, development & implementation (6)
Database administration (4)
Chargeback issues (3)
Client/Server (3)
Future emphasis (3)
CASE (2)
More of the same (2)
Artificial intelligence/expert systems
Change: methods of implementing
Communications: infrastructure, telecommunications
Computing; departmental, UNIX, administrative
Control of program change requests from simple, through scheduling, testing & installation.
Cooperative processing
Cutting edge technology implementation

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What topics would you like to hear at future conferences? continued

Decentralization
Decision support & EIS for senior management
Development techniques & equipment
Facility design
Follow-ups to initiatives at various institutions
Hypermedia instructional technology
Imaging
Information management & records management
Mergers
Strategic responsibility to humanity
Technology
Training mainframers on the new technologies of transparent platforms
Vertical & horizontal integration of hardware platforms & info systems
4 GL

What speakers would you like to hear at future conferences?

Tom West again! (4)
Dr. Wetherbe again! (3)
Celebrity type speakers (3)
Bill Gates, Microsoft (2)
Bob Heterick (2)
Lew Temares (2)
Steve Jobs, Next (2)
CIOs
Actual users to speak from experience
Outside the organization
Winners in the micro arena
Al Gore
Dr. Donovan - Management of Info. Resources
Duane Whitmire
Ed Demming's Quality Management
Jim Penrod, Great presentation!
Joel Barker, futurist
John Dvorak
John Naisbitt
John Sculley, Apple
Marvin Cetron, futurist
Peter Coffee
Ray Noorda
Robert Reich, Harvard KSG
Warren McFarlan, Harvard
Fred Hofstetter

Do you have any comments about the site of CAUSE90?

Fine, excellent, great location, loved it! (100)
Fontainebleau good choice, all under one roof, good facilities, food, services & support (34)
Agenda was too full to enjoy the ocean or city, perhaps more time in mid day (12)
Resort area good choice, warm climate, ocean nice (8)
Expensive (7)
Air conditioning too high, too cold!! (6)
Small rooms (6) Hotel a little rundown
City: not particularly fond of, unsafe, uninteresting (5)
Hard to find way around hotel (4)
Hotel staff, service could have been better (2)
Too far from home, prefer more central location (2)
Too close to home
Food choices were limited.
Less glitter and more practicality
Prefer more rustic
Super service coupons weren't honored
The pits, just another big city hotel
What about Vancouver, BC?

What CHANGES would you like to see in future conferences?

Don't have the conference in such a captive location. (12)
More time in corporate demo area (7)
Real food for final lunch to get us through our travel home. (3)
CAUSE needs to regain the theory/practical experience balance that it used to have. (2)
Current format doesn't permit time for sufficient development of ideas. (2)
One more day of Track sessions. (2)
Check out time should be after the conference ends.
Reduce the number and length of breaks.
Schedule <u>user</u> presentations all day long.
Make a podium available for all presentations.
Fine tune Round Tables: physical layout and either more time-less presenters-or more focus.
More Round Table sessions.
Better description of Track sessions.
Please, no panels of experts as I've yet to see one done well.
Grouping of similar organizations (ie., private, medium, multi campus, etc)
More informal "meeting" sessions for constituent groups, breakfasts, etc.
More opportunities for newcomers.
More lunch buffets.
Something more for morning breaks besides coffee.
Less emphasis on CIOs
In a setting like Miami, have more free time during the day.
Should pre-conference workshops be part of the evaluation?
There are too many alternatives for any one time slot.
More vendor presentations dealing with future directions.
More interactive computer aided workshops (both corporate & institution)

What made you decide to attend CAUSE90? Rank in order of importance the following with "1" indicating the most important:

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Program content	57	41	33	20	4	5	0
Networking with colleagues	49	45	33	20	7	5	1
Professional development	45	34	38	17	11	2	1
Identification with CAUSE	27	16	17	28	18	10	10
Peer recommendation	13	10	10	7	17	20	15
Conference location	4	9	13	18	23	22	23
Corporate demonstrations	2	7	13	26	21	17	18
Other*							

* Involved in presentation (4)
Committee obligations
Review of issues
History of attending
Vendor suites
Boss's recommendation

"I WOULD LIKE TO SAY..."

The best professional (organized) conference I attend. (17)
Thanks. I enjoyed the conference. (15) and early morning coffee!
My first CAUSE—I'm impressed. (7)
The "live centerpieces" were inappropriate. (3)
Good balance, good overall conference. (3)
The pocket conference guide was great. (2)
CAUSE is becoming more & more pre-eminent as a collective voice for universities!
Don't need big name speakers, but those who know education from the basics.
Daily CHAT is a great idea.
The Apple message system was great! Thank you U of Miami for access.
The conference is getting too big!
A map in the program would be a good idea.
The music Thursday night was a pleasant experience.
The hotel staff were not friendly nor helpful.
I was delighted to see so many high ranking administrators.

"If you have your nose to the grindstone everything looks rough. CAUSE makes me pick my head up once in a while and look around." Judy Judkins, Colby College

"Thanks for a very worthwhile week—I made many new friends and gained new insight from vendors and sessions." Bob Fryberger, University of Colorado, Boulder

"CAUSE provides a unique forum when the blending of practical uses of theoretical concepts creates a fountainhead for new ideas" John Wasileski, Arizona State U.

"How delighted I was to see so many high ranking administrators. Their presentation and participation made this a valuable experience." Janet Smith, Thomas Jefferson U.

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Should CAUSE continue the EAST/CENTRAL/WEST rotation of conference locations?

156 Yes 5 No 36 No opinion

Other associations are holding conferences in Hawaii and Las Vegas. We would like to know how you feel about CAUSE conferences in these locations. Are there any institutional restrictions or other reasons that would result in your NOT attending a CAUSE conference in:

Hawaii 51 No institutional restrictions 142 Yes, there are institutional restrictions

explain

Too expensive (78)
Difficult to justify (31)
Excessive air travel, time (18)
Would love it, but... (12)
Too distractive (4)
Would severely limit attendance (4)
Yes, yes, yes—always wanted to go there (2)
NACUBO failed there

Las Vegas 114 No institutional restrictions 72 Yes, there are institutional restrictions

explain

Image, would not be appropriate (28)
No problem, but I'd prefer... (12)
No, I don't like the place (8)
If they have the facilities, why not? (8)
Distracting (7)
Too many activities already are booked there. (7)
It would be inexpensive (6)
Difficult to justify (2)

Do you like the November/December dates for the CAUSE conference?

153 Yes 35 No

I prefer:	15 Jan	15 Feb	10 Mar	2 Apr	5 May
	4 Jun	4 Jul	3 Aug	2 Sep	3 Oct

Don't make it too close to:
CUMREC, Decus, EDUCOM (3), or the holidays (3)

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CAUSE 90

MIAMI BEACH

NOVEMBER 27-30, 1990

PROGRAM 9047R

Challenges and Opportunities of Information Technology in the 90s

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☐ TAPE 5 DELOITTE & TOUCHE - EFFECTIVE UTILIZATION OF CASE TECHNOLOGY
☐ TAPE 6 EDUTECH INTERNATIONAL - SELF-ASSESSMENT FOR THE CAMPUS COMPUTING AREA
☐ TAPE 7 INFORMATION ASSOCIATES - CUSTOMER/SUPPLIER PARTNERSHIPS FOR THE 90'S
☐ TAPE 8 SYSTEMS & COMPUTER TECHNOLOGY - LEVERAGING INFORMATION WITH TECHNOLOGY
☐ TAPE 9 STORAGETEK - AUTOMATION - HAVE WE REALLY STARTED
☐ TAPE 10 THURSDAY GENERAL SESSION - COMPETING WITH COMPUTING
☐ TAPE 11 DATATEL - DEVELOPMENT OF ADMINISTRATIVE DATA PROCESSING SOFTWARE
☐ TAPE 12 IBM - GRAPHICAL INTERFACE ALTERNATIVES FOR PS/2
☐ TAPE 13 JOHN MINTER ASSOCIATES - DESKTOP DATABASES FOR INSTITUTIONAL PLANNING
☐ TAPE 14 KPMG PEAT MARWICK - END-USER COMPUTING - WHERE IS THE PAYOFF?
☐ TAPE 15 NOVELL - INTERGALACTIC NETWORKING WITH NOVELL & NETWARE
☐ TAPE 16 PERIPHONICS CORPORATION - VOICE PROCESSING TECHNOLOGY IN HIGHER EDUCATION
☐ TAPE 17 SUN MICROSYSTEMS - PARTNERS FOR ADMINISTRATIVE & LIBRARY COMPUTING
☐ TAPE 18 WANG LABORATORIES, INC. - CAMPUS IMAGING
☐☐ TAPES 19 & 20 FRIDAY GENERAL SESSION - INFORMATION ACCESS IN ACADEME (2-TAPE SET)

TRACK PRESENTATIONS - WEDNESDAY, NOVEMBER 28, 1990

☐ TAPE 21 TRACK I - FUTURE DIRECTIONS IN HIGHER EDUCATION: CIO'S PERSPECTIVE
☐ TAPE 22 TRACK II - ACHIEVING EXCELLENCE - ACADEMIC COMPUTING
☐ TAPE 23 TRACK III - THE CIO IN HIGHER EDUCATION AND HEALTH CARE
☐ TAPE 24 TRACK V - WHAT'S NEW IN TELECOMMUNICATIONS?
☐ TAPE 25 TRACK VI - NETWORKED INFORMATION RESOURCES AND SERVICES
☐ TAPE 26 TRACK VII - THE IOWA STUDENT INFORMATION SERVICES - A DISTRIBUTED APPROACH
☐ TAPE 27 TRACK VIII - RENDERING AN ACADEMIC TECHNOLOGY VISION
☐ TAPE 28 TRACK I - STRATEGIC PLANNING IN A NON-STRATEGIC ENVIRONMENT
☐ TAPE 29 TRACK II - A DISTRIBUTED MICROCOMPUTER-BASED PLANNING MODEL - A CASE STUDY
☐ TAPE 30 TRACK III - DESKTOP POWER: ISSUES AND OPPORTUNITIES
☐ TAPE 31 TRACK IV - BACKUPS FOR PAYROLLS
☐ TAPE 32 TRACK V - COMPUTER-TO-COMPUTER COMMUNICATIONS: WHEN E-MAIL IS NOT ENOUGH
☐ TAPE 33 TRACK VI - ACCESS, EQUITY, AND ACADEMIC INFORMATION
☐ TAPE 34 TRACK VII - U-BUY ONLINE REQUISITIONS - ONE GIANT STEP
☐ TAPE 35 TRACK VIII - A FRAMEWORK FOR DISTRIBUTED DECISION SUPPORT
☐ TAPE 36 TRACK I - THE BIOMEDICAL INFORMATION COMMUNICATION CENTER
☐ TAPE 37 TRACK II - TURNING A PRIVATE LABEL CREDIT CARD INTO A MULTI-FUNCTION ID CARD
☐ TAPE 38 TRACK III - ACHIEVING THE POTENTIAL OF INTEGRATED ADMINISTRATIVE COMPUTING
☐ TAPE 39 TRACK IV - A CASE FOR COMMON USER IDENTIFIERS
☐ TAPE 40 TRACK V - MARKETING PRINCIPLES EXTENDED: CREATING A STATE-WIDE NETWORK
☐ TAPE 41 TRACK VI - EMPIRE STATE COLLEGE: MANAGING ACADEMIC INFORMATION SYSTEMS
☐ TAPE 42 TRACK VII - SMALL-SCALE DOCUMENT IMAGING
☐ TAPE 43 TRACK VIII - DISTRIBUTED INFORMATION FOR DECISION SUPPORT

TRACK PRESENTATIONS - THURSDAY, NOVEMBER 29, 1990

☐ TAPE 44 TRACK I - REENGINEERING: A CONCEPT FOR HIGHER EDUCATION
☐ TAPE 45 TRACK II - KEYS TO SUCCESS FOR SENIOR LEVEL COMPUTER MANAGERS
☐ TAPE 46 TRACK III - MERGING ADMINISTRATIVE & ACADEMIC COMPUTING
☐ TAPE 48 TRACK IV - A WORKING MODEL FOR MANAGING DATA STANDARDS & POLICIES
☐ TAPE 49 TRACK V - NETWORKS BEGET NETWORKS
☐ TAPE 50 TRACK VI - INFORMATION ACCESS: COMPUTING SERVICES & LIBRARIES
☐ TAPE 51 TRACK VII - CLIENT-CENTERED STRATEGIC PLANNING
☐ TAPE 52 TRACK VIII - COORDINATION OF DISTRIBUTED ACTIVITIES
☐ TAPE 53 TRACK I - TRANSITION YEARS FOR INFORMATION TECHNOLOGY
☐ TAPE 54 TRACK II - WAYS TO SET PRIORITIES AMONG COMPETING PROJECTS
☐ TAPE 55 TRACK III - MERGING ADMINISTRATIVE & ACADEMIC COMPUTING, PT. 2.
☐ TAPE 56 TRACK IV - ADDING VALUE: THE ROLE OF DOCUMENTATION IN SYSTEMS DEVELOPMENT
☐ TAPE 57 TRACK V - NETWORKING IN RESIDENT HALLS: PARTICIPATION & IMPACT
☐ TAPE 58 TRACK VI - PLANNING & IMPLEMENTATION OF ACADEMIC INFORMATION SYSTEMS
☐ TAPE 59 TRACK VII - A DEGREE AUDIT SYSTEM IMPLEMENTATION IN A DISTRIBUTED ENVIRONMENT
☐ TAPE 60 TRACK I - BUILD OR BUY? - PERSPECTIVES FROM THREE INSTITUTIONAL SETTINGS
☐ TAPE 62 TRACK III - DEVELOPING A CIRCLE OF SERVICES FOR MICROCOMPUTER END USERS
☐ TAPE 63 TRACK IV - DEVELOPMENT ISSUES OF A CAMPUS COMPUTING & INFORMATION POLICY
☐ TAPE 64 TRACK V - INTEGRATION OF VOICE, DATA, & VIDEO SERVICES VIA A WIDE AREA NETWORK
☐ TAPE 65 TRACK VI - A COLLEGE POLICY ON COPYWRITED MATERIAL
☐ TAPE 66 TRACK VII - CUSTOMIZED TOOLS
☐ TAPE 67 TRACK VIII - CAMPUS-WIDE ROBMS: A SEARCH FOR PARTNERSHIPS

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☐ TAPE A CASE TECHNOLOGY ON CAMPUS: THE MANAGEMENT ISSUES
☐ TAPE B CLIENT/SERVER ARCHITECTURE
☐☐ TAPES C & D ISDN - WHAT TO EXPECT FROM INDUSTRY (2-TAPE SET)

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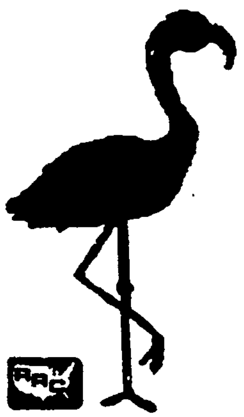

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